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Entomologist's Gazette

An Illustrated Quarterly Journal of British Entomology

1961
Volume 12

Published by E. W. CLASSEY, F.R.E.S., 22 HARLINGTON ROAD EAST,
FELTHAM, MIDDLESEX,
ENGLAND

LIST OF CONTRIBUTORS

Printed by KENION PRESS LTD *Slough, Bucks*

Entomologist's Gazette

anuary, 1961. Vol. 12, No. 1

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ENTOMOLOGIST'S GAZETTE

January, 1961. Vol. 12, No. 1.

ENTOMOLOGIST'S GAZETTE is a Quarterly publication devoted to British Entomology. Papers and Communications should be sent to THE EDITOR, 53 OSTERLEY ROAD, ISLEWORTH, MIDDLESEX.
The Annual Subscription is £2 2s. (£1 16s. if paid by the end of January) and should be sent to *ENTOMOLOGIST'S GAZETTE*, 22 HARLINGTON ROAD EAST, FELTHAM, MIDDLESEX, ENGLAND. Subscriptions can be accepted only for the whole year, commencing with the January number. Advertising enquiries should also be sent to this address.

NEWS AND VIEWS

The Fourth Congress of the **International Union for the Study of Social Insects** is being held in the historic Italian city of Pavia from the 9th to the 14th September, 1961. It is being organized by the Italian section of I.U.S.S.I. under its president, Prof. Carlo Jucci.

The programme includes sections on 'Bees and Wasps', 'Termites' and 'Applied Research', and symposia on 'Endocrinology', 'Caste Differentiation', 'Symbiosis', and 'Gregarism and Subsociality'. Contributions are invited. The proceedings of the Congress will be published.

The fee for full membership is 5,000 Lire (approx. £2 16s.), and for associate members 2,500 Lire. Accommodation in colleges or in hotels will be arranged by the organizing committee if desired.

Application forms are available from W. V. Harris, Esq., c/o. *British Museum (Natural History), London, S.W.7*. Those concerning the submission of papers must be returned to Pavia not later than 31st March, but applications for membership will be received up to 30th April.

A short post-congress excursion to a high altitude research station in the Apennines is under consideration.

SOME INTERESTING DIPTERA FROM BRISTOL

This is a brief list of rare or interesting species caught during the past year or so in or around Bristol. At the outset I should like to thank Mr. E. A. Fonseca for kindly identifying the species and for information regarding their distribution.

Echinomyia ferox Panz. (Tachinidae). One female was caught on 22nd September, 1957, at The Gully, Durdham Downs, Bristol. It was flying slowly over Valerian flowers, settling from time to time.

Ernestia vivida Zett. (Tachinidae). One male was taken in my garden on 30th August, 1958, on Michaelmas Daisies. I have not taken a specimen since, and Mr. Fonseca considers it rather uncommon in this area.

Erycia cinerea Desv. (Tachinidae). This species is new to Somerset, and was bred by my friend, Mr. P. R. Rostron, in very small numbers from larvae of the Marsh Fritillary (*Melitaea aurinia* Rott.) from Charterhouse-on-Mendip, Somerset: five imagines of the fly emerged in 1958, but only one in 1959. Mr. Michael Ackland also informs me that the fly was bred by Mr. C. Bell from larvae of the Marsh Fritillary collected near Wickwar, Gloucs. From this it appears that this fly is gradually extending its range, though from existing records (Cornwall, Dorset, Wilts.—Van Emden, 1954) it might reasonably be expected from Gloucester and Somerset.

Syrphus euchromus Kow. (Syrphidae). The present record is the third from Somerset, a male, 3rd May, 1958, at Leigh Woods, near Bristol. The other two were taken by Col. T. Jermyn (27.v.1921 at Backwell or Banwell), and by Mr. E. A. Fonseca (7.v.1949 at Clevedon). I am indebted to Mr. J. Cowley for this further information on the species.

Volucella zonaria Poda (Syrphidae). A note on the occurrence of this species around Bristol, summarizing the three published records and adding a further six unpublished ones, is at present in preparation.

Fannia aequilineata Ringd. (Muscidae). One male, 21st May, 1959, in my garden. Also recorded from the New Forest. This species is the *Fannia lineata* Stein of the Check List (Kloet and Hincks, 1945); see Collin, 1953.

Hylephila obtusa Zett. (Muscidae). One female, 24th April, 1959. Caught indoors in my house: not a rare species, but a very unusual place for it to be found.

Emmesomyia varipes Strobl. (Muscidae). One female, 10th July, 1959, caught in my garden. A very rare species, hardly known from this country except from Mr. Fonseca's garden at 58 Woodstock Road: this is the first specimen to have wandered down from his garden to mine.

Pegohylemyia humerella Zett. (Muscidae). One male, 13th April, 1959, in my garden. An essentially Scottish species.

REFERENCES

COLLIN, J. E., 1953. Some Additional British Anthomyidae. *J. Soc. Brit. Ent.*, **4** (8):176.

EMDEN, F. I. VAN. Handbooks Identification of British Insects, 10, 4(a), Tachinidae and Calliphoridae. *R. ent. Soc. Lond.*

KLOET, G. S. & HINCKS, W. D. *A Check List of British Insects*. Stockport.

ADRIAN C. PONT.

16 Woodstock Road,
Redland, Bristol 6.
29th January, 1960.

ASTIPHROMMA STRENUUM HOLMGR. (HYMEN), A HYPERPARASITE OF *MINUCIA LUNARIS* SCHIFF. (LEP.)

The publication of the paper on hymenopterous and dipterous parasites of Lepidoptera by Hammond and Smith (1953, *Ent. Gaz.*, **4**:273; *et seq.*) has stimulated considerable interest in this subject as well as reminding the writer of this note that he had an old and unpublished record appertaining to *Minucia lunaris*. This species is not mentioned in the above list, which is not surprising as it had only been bred from feral larvae in Britain on one occasion prior to 1948. In July of that year larvae were found plentifully feeding on oak stools in the Ham Street area, S. Kent.

One of these larvae died in its third instar on the 25th July and a parasitic larva emerged from the ventral surface and spun a smooth brown cocoon between its host and a small oak leaf, thus firmly cementing the remains of the lepidopterous larva to the leaf. On 14th August a small hymenopteron emerged which was duly identified as *Astiphromma strenuum* Holmgr. by Mr. R. D. Eady of the Commonwealth Institute of Entomology to whom the writer is greatly indebted for this identification and the following information.

This species of Hymenoptera is noted by Morley as a hyperparasite of *Dusona falcator, brevicornis* and *Spudastica kreichbaumeri*, these three species being parasitic on larvae of several widely separated genera of Lepidoptera. *S. kreichbaumeri* has been bred from *Orthosia stabilis, gracilis, incerta* and *Dicycla oo*. Another species *Astiphromma alarius* has been bred ex *Dusona mixtus* from the larva of *Catocala nupta*.

T. G. HOWARTH.

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NOTES ON REARING *PERIZOMA SAGITTATA* F. (LEP., GEOMETRIDAE)

For several years I have been rearing *F. sagittata* F. (Marsh Carpet) from ova and larvae with almost complete success.

The chief trouble in rearing this moth occurs after the larva has pupated, when if the pupa is allowed to get too dry the moth will be unable to emerge, or if it does it will almost certainly be a cripple.

I keep my larvae in a glass container with a loose-fitting lid of the kind often found in refrigerators. I line the bottom with a thick piece of cloth and the larvae pupate either in the food-plant (Common Meadow Rue) or spin a cocoon in the cloth.

At the end of August or early September, when pupation has taken place, I put the box in a garage away from any heat, leaving the old food-plant in the box. From time to time during the winter I place a few green leaves in the box, each time removing the stale ones, but always leaving the old food-plant in place, and not disturbing the pupae.

During the first week of May I bring the box indoors, open all the cocoons and saturate the cloth at the bottom of the box with tepid water and add a few wads of wet cotton wool to ensure the whole is kept really damp. At this stage the old food-plant will become mildewed. I take no notice of this and continue to leave it in the box for the emerging moths to climb on to expand their wings. At this time it is essential to keep the pupae warm; the airing cupboard is a good place as long as the temperature does not go much over 80 deg. F., though I find a warm room quite adequate. Within three weeks the coloration of most of the pupae will change to a shiny black, and they will remain that colour for ten days. About 3rd June the moths will begin to emerge, usually in the late afternoon or early evening. A small proportion of the pupae may remain unchanged in colour; these will go over a second winter and usually emerge in the following May.

D. More.

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Rayleigh, Essex.

EUMENIS SEMELE L. IN MID-JUNE

I have to record that I took a male Grayling on Brean Down, Somerset, on 19th June, 1960. This is by far the earliest date I have ever seen this species on the wing. At the same time and place the Dark Green Fritillary (*Argynnis aglaia* L.) and the Marbled White (*Melanargia galathea* L.) were both in numbers.

I. R. P. Heslop.

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Somerset.

EQUIPMENT FOR INSECT PHOTOGRAPHY

By J. A. FINDLAY

The Close Approach

There are many ways of taking insect photographs, and the one selected will depend upon available equipment or available money. To obtain a good photograph, the largest possible image must be brought into focus in the film plane, and, because the subject is usually small, this demands a close approach. There are two methods of obtaining a sharp image at close range. The first is to place a positive lens over the camera lens and take the photograph from a fixed distance, which depends upon the power of the accessory lens. This method is the only one available to the owner of a camera whose lens can not be separated from its body. The second method is to increase the lens to film distance either with extension tubes or with an extension bellows. An accessory positive lens adds little to the bulk of one's apparatus—a significant advantage when this is hand held. The disadvantages of the method are, first, that focus and frame are fixed for each lens combination and, second, that the accessory lens degrades the image—the second objection is probably unimportant when a less expensive camera is used. Extension tubes also suffer from the fixed focus drawback, so that although more bulky and expensive, the bellows is the apparatus of choice for indoor work and field work on a tripod.[1]

The Type of Camera

From the insect photographer's point of view cameras fall into one of two groups; those in which focusing and framing are carried out through the objective lens and those in which they are not. The first group includes plate, technical and reflex cameras, and the second, roll-film, twin-lens and rangefinder cameras. Rangefinder cameras whose lenses are interchangeable may be used on the reflex principle by the insertion of a mirror housing and they then belong to the first group.

Cameras in the second group are not suitable for macrophotography because of the parallax phenomenon. Manufacturers of some twin-lens and rangefinder cameras supply 'close-up attachments' which depend either on the accessory lens or the extension principle, each having some means of parallax correction, but most insects are too small to fall within their scope. There is only one way for the owner of a simple rangefinder or roll-film camera to take a photograph at close range, and that is to use an accessory lens at a fixed subject distance. When a twin-lens camera is used, a pair of accessory lenses of equal power are attached and focusing and framing are carried out through the viewing lens. The camera, which must be mounted on a tripod with vertical adjustment, is then raised through a fixed dis-

tance, previously determined by experiment, and exposure made through the objective.

For field work it is convenient to have a small camera. The ideal one is undoubtedly the miniature reflex and this should preferably accept interchangeable lenses.[2] Almost as satisfactory is the rangefinder camera used with a mirror housing. Although of limited use, the plate camera deserves mention because it is so very much cheaper than the other members of its group. A 2½ in. by 3½ in. model is ideal, and it is essential to have double and preferably triple bellows extension. The chief drawback lies in the time taken after focusing to replace the ground glass by the plate and to set shutter and aperture because during this time many subjects will have moved or flown away.

The Ideal Lens

Certain points should be borne in mind when selecting a lens for use with a 35 mm. camera of the reflex or rangefinder type.

The standard focal length (about 50 mm.) is of limited use because the subject has to be approached too closely. It is, however, suitable for obtaining a magnified image of the very small insect.

The long focal length lens (about 135 mm.) is useful because the photograph may be taken from a relatively great distance, with less risk of disturbing a nervous subject. Against this advantage must be weighed the disadvantages of a smaller depth of field at each aperture as compared with the shorter focal length lens and its inability to yield a sufficiently large image of the smaller insect at manageable extension.

There remains therefore the medium focal length lens (about 90 mm.). This enables the 35 mm. format to be filled with a wide size-range of subject. Also its features are a compromise of the advantages and disadvantages of lenses at the extremes of focal length. Thus the subject distance is usually great enough to avoid disturbing a nervous insect, the depth of field, while less at each aperture than that of the 50 mm. lens, is greater than that of the 135 mm. lens, and extension, while greater than that required for a 50 mm. lens, is less than that required for a 135 mm. lens.

There are three other aspects of the ideal lens to consider. These are weight, minimum aperture and diaphragm control. Obviously the lens should be as light as possible, the weight largely depending upon the material of which the mount is made. Some 135 mm. lenses are relatively very heavy and clumsy at double extension. When using a rangefinder camera with mirror housing it is important to have a lens whose optical component is separable from its focusing barrel. This is because the housing represents a considerable degree of extension; further fixed extension (of the lens barrel) must therefore be avoided, otherwise a part of the lens' range will be unavailable.

Because field depth is so limited at close range, the smallest aper-

ture consistent with available light should always be used. As will be mentioned later, the best light source for this type of photography is electronic flash and using a powerful unit apertures of down to f45 may be selected even with the 135 mm. lens. There is a tendency for modern lenses to have minimum apertures of f16 or f22; it is however important to select one with a smaller aperture than this.

When focusing is carried out through the objective, the lens aperture must be sufficiently great to enable the photographer to see the image clearly. This means that the taking aperture must be set after focusing—a serious drawback, because during the time taken to do this the subject may move. Further, it is almost impossible to set the aperture of the hand-held camera without moving it with the attendant risk of a subject off centre or out of focus. This problem has been solved by the introduction of the automatic preset diaphragm in which a spring-loaded mechanism automatically closes the diaphragm to a preset aperture when a push button on the lens mount is depressed. This push button may be connected to those operating the mirror and the shutter so that exposure may be made literally within a fraction of a second of viewing the subject through the objective at maximum aperture. The preset diaphragm is a simplification of this mechanism; the setting ring has to be turned by hand to a preset aperture. This represents little advantage over a click-stop setting ring in close-up work.

So far as I am aware there is no lens which combines all of these ideal features. Therefore the importance of each must be considered in relation to the type of work to be undertaken.

The Stand

Whenever possible a stand should be used, even if the subject is to be illuminated by electronic flash. Depth of field and subject framing are so critical that the smallest movement of hand-held apparatus will spoil the photograph. The very nervous insect and the insect on the move render the use of a stand impracticable. Most subjects, however, will remain stationary for sufficiently long periods provided they are approached with care.

There are two types of self-supporting stand for use in the field, each appropriate to different terrain. These are the tripod and the column with ground-spike. The one to select depends upon the distance of the subject from the ground, the hardness of the ground and the nature of its plant cover. A camera mounted several feet from the ground is more stable on a tripod than on a column; on the other hand it is not convenient to place the tripod-mounted camera closer to the ground than the length of the centre post, and this restricts the choice of viewpoint of a subject situated on the ground or on low foliage; for this the column and spike is ideal.[3] The second factor to consider is the hardness of the ground; clearly the spike cannot be driven into tar, rock or baked earth. And third,

there is a question of plant cover; a tripod, unless it is exceptionally heavy, is unstable on ground covered by wiry roots and stems, for example, of heather.

A tripod must have a vertically adjusting centre post, and horizontal adjustment in the form of a separate focusing rack is an advantage. These two features obviate the necessity for moving the legs once they are planted. The second also permits photography at predetermined scales of reproduction by using it (and not the variable extension) as the means of focusing. The column and ground-spike requires an adjustable collar with horizontal arm to hold the camera; again a focusing rack is important. The two types of stand may be combined by having a spike and collar made to fit the centre post of the tripod. Whichever is used, stability and freedom from play more than compensate extra weight and cost.

On those occasions when it is not possible to use a stand, a satisfactory proportion of good results may be obtained using a reflex camera whose lens is equipped with an automatic preset diaphragm. Focusing is then best achieved by moving the previously set camera slowly forward until the subject appears sharply on the screen.

Indoors a number of subjects, especially ova and pupae, are more easily taken from above. For this purpose there are several copying stands on the market, though the column for field work fitted to a socket and table clamp (instead of ground-spike) or the column and baseboard of an enlarger would both serve equally well. And of course some form of wood stand may always be improvised.

The Light Source

There is no doubt that excellent photographs have been taken out of doors by sunlight and indoors by tungsten light, but neither is really suited to insect photography. In the field the sun is frequently obscured by cloud or the subject by shadow from its surroundings. And tungsten illumination can only be used in the studio. A constant, powerful and portable light source is required, and electronic flash is just such a source—but not any electronic flash unit; many models on the market today are not sufficiently powerful. It must be remembered that only a fraction of the total output is reflected from the subject, and of this only a further small fraction is used to expose the film because the limited depth of field at close range demands the smallest apertures. As will be mentioned later, films used for this type of work are necessarily slow. In combination therefore these factors demand a high light output. Perhaps the most notable advantage of electronic flash is its short duration. This feature goes a long way towards solving three important problems of insect photography, namely, camera vibration, voluntary subject movement and movement caused by wind.

The ring flash-head is ideally suited to taking most insect photographs and is particularly convenient in field work. This illuminant,

as its name suggests, is constructed in the form of a ring which fits over the lens flange and therefore throws its light directly on to the subject. Its great advantage over the standard type of flash-head is that it does not cast shadows—these can be exceedingly difficult to avoid when taking photographs among foliage.

The effective duration of the exposure is equal to the duration of the flash, which is constant. Output is also constant, though in some units it may be halved or doubled. Exposure therefore is controlled by aperture adjustment and depends upon flash-head to subject distance, lens extension and the subject and background to be photographed. The approximate aperture to be used at each increment of lens extension must be determined by trial. This figure is then modified according as to whether the subject is light or dark, glossy or dull, and similarly according to background type and proximity. Experience quickly teaches the aperture to select and bracketing exposures is rarely necessary even using colour film.

It has been said earlier that the ring flash-head is suited to most insect subjects, but there are some which are better taken with a standard flash-head. Examples are ova and pupae that have been taken from their natural environment and require to be photographed lying on a sheet of paper or other suitable ground from above. The ring flash-head has two notable drawbacks here. First, its forward position makes the image of a rounded object appear flat, and second, when the subject lies directly on its background it is surrounded by a ring of penumbra; nor can this be avoided by placing the specimen on glass because the image of the flash-head will then appear in the photograph. For these subjects the standard flash-head should be directed obliquely down from a point above the film plane; the other side of the subject is illuminated by reflection from a white card.

It is convenient to have a focusing light to fit either standard or ring flash-head, but a torch will always serve.

The Film

The film selected is important, but what is more important is that the same film should always be used at any rate until it is mastered. For monochrome work a thin emulsion high resolution film gives best results, especially when using a miniature camera. Such a film is necessarily slow, so again a powerful unit is required or one must sacrifice field depth and employ larger apertures. When selecting a colour film, remember that image definition varies practically inversely with speed, so the slowest film consistent with flash output is the best one.[4]

Summary

The purpose of this paper has been to outline the apparatus used to photograph insects. Passing reference has been made to some technical problems, but I have not discussed these in detail because

I believe that once the photographer has the right apparatus he will be able to progress alone. He will quickly come upon problems, but these are best solved by a critical analysis of error and further trial. Insect photography is not especially difficult, but good results only come as a result of the most searching self-criticism. And for inspiration one can not do better than examine the work of the acknowledged masters of wildlife photography.

Notes

[1] When buying a bellows it is important to be sure that there is sufficient clearance between the lens mount and the bellows support for attaching a ring flash-head should this be used, and that the camera, if it employs an oblong format, may conveniently be used in the vertical as well as the horizontal position.

[2] The miniature camera is a personal preference. Excellent results can of course be obtained with the 2¼ in. by 2¼ in. reflex. Many subjects however have to be considerably enlarged to fill the frame so that there is unnecessary use of film and therefore expense. On the other hand, an entomologist primarily interested in macro-lepidoptera would find the larger format more suitable.

[3] In an emergency the centre post may be inverted so that the camera becomes suspended between the tripod legs.

[4] This is only true of definition. Many photographers prefer to sacrifice the better definition of the slow film for the improved colour rendering of the faster one. The choice of colour film is therefore a matter of personal preference.

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Aberdeen.

ORGYIA ANTIQUA L. (LEP., LYMANTRIIDAE) IN CAITHNESS

In spite of the deplorable weather which set in after the first week in July, 1960 was a good year for Lepidoptera in Caithness. There was a marked increase in the numbers of many species, but most spectacularly so in the case of the Common Vapourer (*Orgyia antiqua* L.). This insect is very local here, being confined chiefly to sheltered valleys where scrub birch, hazel and sallow are to be found, and from 1950 to 1957 it was nowhere very common. 1958 and 1959 saw a steady build up of this species, judging by the number of larvae to be seen, and in 1960 larvae were exceedingly abundant. In one locality they were present in such numbers that sallow and birch were being stripped bare. It will be interesting to see when the almost inevitable collapse takes place. I also noticed in one locality that quite a few larvae were to be found on Larch, and this seems to be a new food-plant for them here.

J. H. Rosie.

33 *East Banks,*
Wick, Caithness.

MACROLEPIDOPTERA OF THE CHALFONT AREA, BUCKINGHAMSHIRE

By SIR ERIC ANSORGE, C.S.I., C.I.E., F.R.E.S.

The Buckinghamshire Victoria County list is now over fifty years old and needs thorough revision, and the following list of species of Macrolepidoptera occurring in a particular locality in the south of the county will, I hope, be of use when such revision is undertaken. All the species included, except those in brackets, have been taken by me during the last few years within a radius of a mile or two from my house in Chalfont St. Peter. In 1887 the Rev. J. Seymour St. John published in *The Entomologist,* Vol. **20**, page 89, a list (of moths only) for the same locality, and it is interesting to note the differences between this seventy-year-old list and mine. His list, which contains only about 150 names, includes about eight species which I have not come across here yet, but two of them, *viz. E. lichenea* and *T. simulata* (= *cognata* Thunb.) are probably mistakes: neither was included in the County list eighteen years later. The rest, indicated thus * in the present list, have nearly all been recorded more recently from other places in South Bucks and will probably turn up here again sooner or later. On the other hand, he includes none of the Sphingidae and only one of the Notodontidae, *P. palpina,* whereas my list includes ten of the former and fifteen of the latter. The explanation lies of course in the use since his day of electric and recently mercury vapour light, and it is a significant commentary on the value of the latter for ascertaining the fauna of any locality that until I installed a mercury vapour light-trap in 1957 *M. stellatarum* was about the only Sphingid, and *S. fagi, L. capucina* and *L. palpina* the only Notodontids which I had seen here; yet the mercury vapour light has shown that many of the species are present in abundance.

Species not included in the County List of 1905 (39 in all) are designated thus †. A total of 431 species are recorded in the present list and the appended supplementary list.

RHOPALOCERA

SATYRIDAE

P. aegeria L., *P. megera* L., *M. galathea* L., fairly common; *S. semele* L., not as common as the preceding species. *M. tithonus* L., *M. jurtina* L., *C. pamphilus* L., *A. hyperantus* L., very common.

NYMPHALIDAE

A. euphrosyne L., I have only seen it once here, in 1957. (*A. charlotta* Haw., *A. paphia* L., occasionally seen here; I have not come across them myself.) *V. atalanta* L., not uncommon in most years. *V. cardui* L., usually not plentiful. *A. urticae* L., *V. io* L., very

common. *P. c-album* L., abundant in some years but sometimes scarce. (*L. camilla* L., reported from Gerrards Cross. I have not seen it here myself.)

LYCAENIDAE

(*C. minimus* Fues. has been taken here, but not by me.) *A. agestis* Schiff., I have only seen it once here, in 1952. *P. icarus* Rott., very common. *C. argiolus* L., fairly common. *L. phlaeas* L., common. *C. rubi* L., fairly common at suitable spots. *T. quercus* L., occasional; has come to mercury vapour light. (*S. w-album* Knoch, has been taken here, but not by me.)

PIERIDAE

P. brassicae L., *P. rapae* L., *P. napi* L., very common. *A. cardamines* L., *G. rhamni* L., common.

HESPERIIDAE

E. tages L., *P. malvae* L., *T. sylvestris* Poda, *O. venata* Br. and Grey, common.

HETEROCERA

SPHINGIDAE

M. tiliae L., apparently uncommon here; one in 1958 and two in 1960 at mercury vapour light. *L. populi* L., common at mercury vapour light. *S. ocellatus* L., fairly common at mercury vapour light. (*A. atropos* L., I have heard of specimens taken here but have not been able to verify this.) *S. ligustri* L., fairly common at mercury vapour light. † *H. pinastri* L., two at mercury vapour light in 1957 and two in 1959. *D. porcellus* L., and *D. elpenor* L., common at mercury vapour light. *M. stellatarum* L., not very common here. (*H. fuciformis* L., and *H. tityus* L.; I have seen specimens which have been caught here but have not taken either of these species myself.)

NOTODONTIDAE

H. hermelina Goeze, one at mercury vapour light in 1957. *C. vinula* L., not very common. *S. fagi* L., common at light; mostly the dark variety. *D. dodonaea* Schiff., common at mercury vapour light. *C. ruficornis* Hufn., less common than the preceding but fairly plentiful. *P. tremula* Cl., *P. gnoma* Fab., *N. ziczac* L., *N. dromedarius* L., common at mercury vapour light. *N. anceps* Goeze, a few each year at mercury vapour light. *L. cucullina* L., two at mercury vapour light in 1957 and one in 1959. *L. capucina* L., common. *P. palpina* Cl., much less common than the preceding. *P. bucephala* L., common. *C. curtula* L., moderately common at mercury vapour light.

THYATIRIDAE

H. pyritoides Hufn., *T. batis* L., usually fairly common. *T. ocularis* L., not very common: the melanic form occurs occasionally. *T. duplaris* L., two in 1959. *A. diluta* Schiff., moderately common. *A. flavicornis* L., not common. *P. ridens* F., not common.

LYMANTRIIDAE

O. antiqua L., I have not found it common here. *D. pudibunda* L. and *E. similis* Fues., common. *L. salicis* L. and *L. monacha* L., not common.

LASIOCAMPIDAE

M. neustria L., common. *P. populi* L., common at mercury vapour light. *M. rubi* L., one ♀ at mercury vapour light in 1957. *P. potatoria* L., very common. *G. quercifolia* L., one in 1959 and one in 1960.

DREPANIDAE

D. falcataria L., common. *D. binaria* Hufn., *D. cultraria* F., *D. lacertinaria* L., fairly common. *C. glaucata* Scop., common.

NOLIDAE

N. cucullatella L., fairly common. *C. confusalis* H.-S., a few at mercury vapour light.

ARCTIIDAE

S. lubricipeda L. and *S. lutea* Hufn., common. *C. mendica* Cl., moderately common. *P. fuliginosa* L., *A. caja* L. and *C. jacobaeae* L., common.

LITHOSIINAE

M. miniata Forst., one at mercury vapour light in 1958. (*C. mesomella* L., I have heard of it being taken here but have not seen it myself.) *E. lurideola* Zinck., common. *E. complana* L., fairly common at mercury vapour light.

NOCTUIDAE

AGROTINAE

E. nigricans L., apparently scarce: one in 1958. *A. segetum* Schiff., *A. clavis* Hufn., *A. puta* Hübn. and *A. exclamationis* L., very common; the dark forms also occur. *A. ipsilon* Hufn., *L. varia* Vill. and *P. porphyrea* Schiff., fairly common. *G. augur* F. and *D. brunnea* Schiff., common. *D. festiva* Schiff., very common. *(*D. dahlii* Hübn., I have not taken it myself; it occurs nearby at Chesham). *D. rubi* Vieweg, common. *O. plecta* L., very common. *A. baja* Schiff., not uncommon. *A. c-nigrum* L., very common. *A. triangulum* Hufn., fairly common. *A. stigmatica* Hübn., not common. *A. sexstrigata* Haw., *A. xanthographa* Schiff., *A. putris* L., common. *T. pronuba* L., very common. *T. comes* Hübn. and *T. ianthina* Schiff., common. *T. interjecta* Hübn., not common: a few at mercury vapour light. *L. fimbriata* Schreb., moderately common. *G. leucographa* Schiff., one in 1959 and one in 1960. *C. rubricosa* Schiff., generally common. *P. typica* L., fairly common.

HADENINAE

M. brassicae L. and *M. persicariae* L., common. † *P. hepatica* Cl., scarce, one in 1954 and one in 1957. *P. nitens* Haw., *P. nebulosa*

Hufn., common at mercury vapour light. *D. oleracea* and *C. pisi* L., common. *H. nana* Hufn., moderately common. *H. trifolii* Hufn., not common. *H. w-latinum* Hufn., and *H. thalassina* Hufn., fairly common at mercury vapour light. *H. serena* Schiff., common. *H. conspersa* Schiff., generally a few each year at mercury vapour light. *H. bicruris* Hufn. and *H. cucubali* Schiff., common. *H. lepida* Esp., scarce; one in 1952 and one in 1958. *O. gothica* L., very common. *O. cruda* Schiff., *O. stabilis* Schiff. and *O. incerta* Hufn., common. *O. munda* Schiff., moderately common. † *O. advena* Schiff., fairly common at mercury vapour light. *O. gracilis* Schiff., common at mercury vapour light. *T. popularis* F., common. † *T. cespitis* Schiff. not uncommon at mercury vapour light. *C. graminis* L., common. *L. pallens* L., *L. impura* Hübn., *L. comma* L., *L. conigera* Schiff. and *L. lithargyria* Esp., common.

CUCULLIINAE

C. verbasci L., one in 1959. *C. chamomillae* Schiff., a few at light. *C. umbratica* L., one in 1952, two in 1958 and one in 1960. *B. sphinx* Hufn., common at mercury vapour light. *B. viminalis* F., fairly common; the melanic form occurs occasionally. † *A. lutulenta* Schiff., not uncommon at mercury vapour light. *(*L. semibrunnea* Haw.). *X. areola* Esp., common. *E. adusta* Esp., scarce; two in 1957. *A. oxyacanthae* L., common; also the dark form *capucina* Müll. *G. aprilina* L., not at all common. † *P. suspecta* Hübn., scarce. *D. protea* Schiff., common. *A. flavicincta* Schiff., scarce but generally a few each year. *(*A. chi* L.). *E. transversa* Hufn. and *O. lunosa* Haw., common. *A. lota* Cl., much less common than the following species. *A. macilenta* Hübn., very common. *A. circellaris* Hufn., common. *A. lychnidis* Schiff., very common. *A. helvola* L., common. *A. litura* L., common. *A. xerampelina* Esp., scarce; two in 1958 and one in 1960. *T. citrago* L., *T. aurvago* Schiff., † *C. lutea* Ström and *C. icteritia* Hufn., common. *(*C. gilvago* Schiff.). (*C. erythrocephala* Schiff.—I believe one was recorded from Chalfont in 1952, but I have not been able to verify this.) *C. vaccinii* L. and *C. ligula* Esp., common.

ACRONICTINAE

C. perla Schiff., common. *A. leporina* L., fairly common. *A. psi* L., common. *A. tridens* Schiff., a few at mercury vapour light: probably often confused with *A. psi*. *A. aceris* L. and *A. megacephala* Schiff., fairly common. *A. rumicis* L., common.

AMPHIPYRINAE

M. maura L., apparently no longer very common. *A. pyramidea* L. and *A. tragopoginis* Cl., common. *D. scabriuscula* L., fairly common. *R. umbratica* Goeze, common. *A. ypsilon* Schiff., one in 1956. *A. lithoxylaea* Schiff., not very common. *A. monoglypha* Hufn., very common. *A. sublustris* Esp., two in 1959 and three in 1960.

A. crenata Hufn., common, as also the form *alopecurus* Esp. *A. characterea* Hübn. and *A. sordens* Hübn. common. *A. infesta* Ochs. and *A. obscura* Haw., fairly common. *A. secalis* L., very common. † *A. ophiogramma* Esp., occasional; two in 1954 and two in 1958. *P. strigilis* Cl., common. † *P. latruncula* Schiff., fairly common. † *P. versicolor* Borkh., one in 1954. *P. fasciuncula* Haw., fairly common. *(*P. literosa* Haw.). *P. furuncula* Schiff., fairly common. *L. testacea* Schiff., common. *E. lucipara* L., moderately common. *P. meticulosa* L., very common. *T. matura* Hufn., moderately common. *P. minima* Haw., a few most years at mercury vapour light. *M. trigrammica* Hufn., very common. *C. morpheus* Hufn., *C. alsines* Brahm and *C. blanda* Schiff., common. *C. clavipalpis* Scop., not very common, but a few most years. *H. oculea* L. and *H. micacea* Esp., common. † *H. petasitis* Doubld., one in 1958. *G. flavago* Schiff., moderately common. † *P. umbra* Hufn., occasional: one or two most years. *D. oo* L., one in 1957 and two in 1960. *C. pyralina* Schiff., fairly common. *C. trapezina* L., very common. *Z. subtusa* Schiff., one in 1954. *R. lutosa* Hübn., one in 1958 and one in 1959. † *A. pygmina* Haw., not common. *(*N. typhae* Thunb., has been taken here recently, but I have not found it myself).

EUSTROTIINAE

J. pygarga Hufn., not uncommon at mercury vapour light.

WESTERMANNIINAE

B. fagana F., common. *P. prasinana* Cl., scarce; two in 1957.

CATOCALINAE

E. mi Cl., seems to be much less common than the following species. *E. glyphica* L., common. *C. nupta* L., does not appear to be very common here.

PANTHEINAE

C. coryli L., common; ab. *melanotica* Haverkpf., also occurs but not nearly so commonly.

PLUSIINAE

† *P. moneta* F., common in some years. *P. chrysitis* L., very common. † *P. festucae* L., one in 1959. *P. iota* L. and *P. pulchrina* Haw., common. *P. gamma* L., very common. *A. tripartita* Hufn., common. *A. triplasia* L., scarce; one in 1952. *E. caeruleocephala* L., scarce; two in 1957. *S. libatrix* L., two in 1959 and three in 1960.

OPHIDERINAE

† *R. sericealis* Scop., one in 1958 and one in 1959.

HYPENINAE

† *H. proboscidalis* L., common. † *Z. tarsipennalis* Treit. and *Z. grisealis* Schiff., fairly common. *L. flexula* Schiff., moderately common.

GEOMETRIDAE

GEOMETRINAE

† *P. pruinata* Hufn., scarce. *H. papilionaria* L., a few most years. *H. immaculata* Thunb. and *C. pustulata* Hufn., moderately common. *J. lactearia* L. and *H. aestivaria* Hübn., common.

OENOCHROMINAE

A. aescularia Schiff., common.

STERRHINAE

S. seriata Schr. and *S. fuscovenosa* Goeze, common. † *S. subsericeata* Haw., not common. *S. emarginata* L., not common. *S. aversata* L. and *S. biselata* Hufn., common. *S. dimidiata* Hufn. and *S. trigeminata* Haw., moderately common. *S. floslactata* Haw., *S. imitaria* Hübn. and *C. amata* L., common. † *C. puppillaria* Hübn., one ab. *badiara* Stgr. in 1957, *vide Ent. Gaz.*, **9**: 44. *C. punctaria* L., not common. *C. linearia* Hübn., common; also ab. *strabonaria* Zell. *C. pendularia* Cl. and † *C. albipunctata* Hufn., scarce.

LARENTIINAE

X. quadrifasciata Cl., moderately common. *X. ferrugata* Cl., and *X. spadicearia* Schiff., common. *X. montanata* Schiff., common. *X. designata* Hufn., one in 1955, two in 1959 and one in 1960. *X. fluctuata* L., common. *O. mucronata* Scop., scarce; one in 1958 and one in 1959. *O. chenopodiata* L., common. *L. clavaria* Haw., moderately common. *C. pectinataria* Knoch, common. *C. multistrigaria* Haw., very scarce. *E. badiata* Schiff. and *C. derivata* Schiff., common. *M. albicillata* L., rather scarce. *P. alchemillata* L., common. *P. flavofasciata* Thunb., scarce. *P. albulata* Schiff., one in 1957 and one in 1960. *E. unangulata* Haw., common. † *E. cuculata* Hufn., not very common. *E. bilineata* L., common. *M. procellata* Schiff., common. *L. ocellata* L., common. *L. suffumata* Schiff., one in 1960. *E. corylata* Thunb., common. † *P. comitata* L., not very common. *E. silaceata* Schiff., common. *L. testata* L., *L. populata* L. and *L. mellinata* F., fairly common. *L. pyraliata* Schiff., several in 1959. *C. fulvata* Forst., common. *P. bicoloraria* Hufn., scarce. *D. truncata* Hufn. and *D. citrata* L., common. *T. obeliscata* Hübn. and *H. furcata* Thunb., very common. *P. vetulata* Schiff., one in 1960. *P. transversata* Hufn., very scarce; one in 1952. *T. dubitata* L., scarce; one in 1956 and one in 1958. *C. legatella* Schiff., moderately common. *A plagiata* L. and † *A. efformata* Guen., common. *E. alternata* Müll., common. *E. subumbrata* Schiff., moderately common. *E. inturbata* Hübn., scarce; one in 1952. † *A. haworthiata* Doubld., scarce; a few at light. † *E. linariata* Schiff. and *E. pulchellata* Steph., moderately common. *E. exiguata* Hübn., *E. venosata* F. and *E. centaureata* Schiff., moderately common. *E. intricata* Zell., ssp. *arceuthata* Frey., one in 1957, one in 1958 and two in 1959. *E. satyrata* Hübn., one in 1952. *E. tripunctaria* H.-S., one in 1953 and one in 1960. *E. absinthiata* Cl., common. *E. assimilata* Guen.,

one in 1956 and one in 1958. *E. vulgata* Haw., very common. *E. castigata* Hübn., common. *E. icterata* Vill., ssp. *subfulvata* Haw., common. *E. succenturiata* L., common. † *E. pimpinellata* Hübn., scarce. † *E. nanata* Hübn., scarce; one in 1957 and two in 1958. † *E. virgaureata* Doubld., one in 1952. *E. abbreviata* Steph., moderately common. *E. sobrinata* Hübn., *E. lariciata* Frey. and *E. tantillaria* Boisd., common. *C. rectangulata* L., common; mostly the melanic form. *C. coronata* Hübn., moderately common. *G. pumilata* Hübn., common. *H. tersata* Schiff., rather scarce. *A. viretata* Hübn., scarce; two in 1952 and one in 1957. † *L. halterata* Hufn., scarce; three in 1957. † *N. carpinata* Borkh., very scarce; one in 1957. † *O. autumnata* Borkh., not at all common but probably often overlooked. *O. dilutata* Schiff., very common. † *O. christyi* Prout, one in 1955 and one in 1959. *O. brumata* L. and *O. fagata* Scharf., very common. *A. albulata* Hufn., moderately common. *H. flammeolaria* Hufn., scarce. (*D. blomeri* Curt., still taken in the neighbourhood but I have not taken it here myself.)

ENNOMINAE

A. grossulariata L., common. *A. sylvata* Scop., scarce; one in 1957 and one in 1960. *L. marginata* L. and *L. adustata* Schiff., common. *B. temerata* Schiff., *B. bimaculata* F. and *C. pusaria* L., common. *C. exanthemata* Scop., less common than the preceding species. *E. fasciaria* Schiff., not uncommon at mercury vapour light. *C. margaritata* L., common. *E. quercinaria* Hufn., *D. alniaria* L., *D. fuscantaria* Haw. and *D. erosaria* Schiff., common. *S. bilunaria* Esp., very common. *S. lunaria* Schiff., one in 1957 and one in 1960. *S. tetralunaria* Hufn. moderately common. *G. bidentata* Cl., *C. pennaria* L., and *C. elinguaria* L., common. *O. sambucaria* L., common. *P. dolabraria* L., moderately common. *E. luteolata* L. and *P. macularia* L., common. † *S. notata* L., one in 1959. *S. liturata* Cl., common; the melanic form occurs occasionally. *I. wauaria* L., common. *T. rupricapraria* Schiff., common. *E. leucophaearia* Schiff. common; the melanic form also occurs. *E. aurantiaria* Esp., *E. marginaria* F. and *E. defoliaria* Cl., very common. *P. pedaria* F., common; ab. *monocharia* Staud., occurs occasionally. *A. hispidaria* Schiff., fairly common at mercury vapour light. *L. hirtaria* Cl., common at mercury vapour light. *B. strataria* Hufn., the ♂ is fairly common at mercury vapour light. *B. betularia* L., the typical form and ab. *carbonaria* Jordan, are common; ab. *insularia* Mieg., less common. *H. abruptaria* Thunb., fairly common; a melanic form occurs. *A. rhomboidaria* Schiff. and *A. repandata* L., common. *B. roboraria* Schiff. and *B. punctinalis* Scop., moderately common. *E. bistortata* Goeze and *E. crepuscularia* Hübn., common. † *A. punctulata* Schiff., common. It is curious that this common species is not on the County List. *E. atomaria* L., common. *(*B. piniaria* L.). *L. chlorosata* Scop. and *C. clathrata* L., common. *(*D. fagaria* Thunb.)

ZYGAENIDAE

Z. filipendulae L., common. *Z. trifolii* Esp., I have only taken a few here.

COSSIDAE

Z. pyrina L., not uncommon at mercury vapour light.

HEPIALIDAE

H. lupulinus L., and *H. sylvinus* L., common. *H. humuli* L., does not seem to be very common here.

SUPPLEMENTARY LIST OF SPECIES RECORDED SINCE THE ABOVE LIST WAS COMPILED

Eilema sororcula Hufn., one in 1960.

Apamea unanimis Hb., one in 1960. † *Caradrina ambigua* Schiff., several in 1960. *Cosmia affinis* L., one in 1960. *Cosmia diffinis* L., one in 1960.

Sterrha inornata Haw., one in 1959 and one in 1960. † *Scopula immutata* L., one in 1960. *Calocalpe cervinalis* Scop., one in 1960. *Horisme vitalbata* Schiff., several in 1960. † *I. brunneata* Thunb., one in 1960 (*Ent. Gaz.*, **11**: 184).

A TORTRICID NEW TO BRITAIN

In February, 1960, my brother, G. E. L. Manley, gave me a larva he had found in some anemones and jonquils which had been purchased in his district, London, S.W.1. Subsequent inquiries suggested that the flowers had been flown from the south of France.

The resulting moth emerged on 8th April and, as it was unknown to me, I consulted Mr. J. D. Bradley of The British Museum (Natural History) who has kindly identified it as *Cnephasia gueneana* Duponchel. He tells me that it is a species previously unrecorded in Britain and that there are specimens in the Museum from Sicily, Palestine and Morocco. Mr. Bradley adds that its known distribution also includes the Canary Islands, Corfu and Crete; and that in the Mediterranean region the imago is found from March to June. This species is nearest *C. longana* Haw., the larva of which also feeds in flower-heads.

LT.-COL. W. B. L. MANLEY.

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THE BRITISH SPECIES OF THE GENUS *PROCRIS* FABRICIUS (LEP., ZYGAENIDAE)

By W. G. TREMEWAN

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The following short note with the accompanying drawings will enable the reader to identify the British *Procris* species.

At present there are three recorded species from the British Isles, viz. *statices* L., *geryon* Hübn., and *globulariae* Hübn. When a new locality is discovered it is advisable to examine the genitalia, which have good specific characters. This will avoid errors in identification which have all too frequently confused our ideas of the geographical distribution of the *Procris* species.

In addition to the male and female genitalia, I figure the male antennae which have good characters for separating the three species.

Procris (Procris) statices Linnaeus

Sphinx statices Linnaeus, 1758, *Syst. Nat.*, 10 ed., p. 495.

The commonest of our three species, *statices* is found in meadows and other suitable localities where its food-plant, Sorrel (*Rumex acetosa* L.), grows. The larva is fully grown after hibernation at the end of April, and the cocoon is constructed on or near the ground, where it is not easily found. The moths fly in the sunshine during June, and sometimes at the end of May, according to the season.

The typical form is bluish-green, and is rare in this country compared with the common bronzy-green form known as ab. *viridis* Tutt. There also occur ab. *obscura* Reuss, which has greyish-black fore wings, and ab. *rubida* Lempke, with the fore wings golden-red. Of the former aberration, there are in the Rothschild-Cockayne-Kettlewell collection at Tring eight specimens which were taken at Chandler's Ford, Hants; and in the same collection and from the same locality are two examples of ab. *rubida* Lempke. It is possible that these aberrations are artifacts. Apparently the chemical composition of the green scales of *Procris* is very unstable as the colour will change to golden-red or an obscure brownish-black in the presence of alcohol. Ammonia and other killing agents will affect the colour of freshly emerged specimens. Such colour change is often permanent and can take place in the relaxing tin.

This species is widely distributed in England, Wales and Scotland; it is also found in Ireland.

In the male genitalia the aedoeagus is large and has a long cornutus (Figs. 1 and 2); in the female genitalia the ostium is broad and heavily sclerotized (Fig. 10). The male antenna is thickened at the apex and the last eleven segments have no pectinations (Fig. 3).

Procris (Procris) geryon Hübner

Sphinx geryon Hübner [1808-1813], *Europ. Schmett.*, **2**: pl. 28, figs. 130, 131.

Procris tenuicornis Zeller, Edmunds *nec* Zeller, 1860, *Ent. wkly. Intell.*, **7**: 196.

This species was first recorded as British in 1860 under the name *tenuicornis* Zeller (Edmunds, 1860), when specimens were taken in Worcestershire. These specimens were later determined as *geryon* Hübner.

It is a widely distributed species but confined to chalk and limestone areas and flies during June and the beginning of July. It is readily distinguished from *statices* and *globulariae* by the genitalia, and the male antennae also have good characters. In the genitalia of *geryon* the aedoeagus is smaller than that of *statices* and has a small, short cornutus (Figs. 4 and 5). In the female genitalia the distinguishing character is the ductus bursae, the greater part of which is heavily sclerotized (Fig. 11). The male antenna is thickened at the apex and the last eight segments are without pectinations (Fig. 6).

The larvae feed on the Rock-rose (*Helianthemum vulgare* Gaertn.), and may be found in the spring after hibernation.

The typical form is golden- or bronzy-green. The deep green form is ab. *viridis* Tutt; and the blue-green form is ab. *caerulea* Tutt. Gynandromorphism occurs in this species; an example in the collection at Tring taken in 1896 in Sutton Wood, Northants, has the right antenna pectinated, while the left antenna is simple and thread-like (vide: *Entomologist* **29**: 215, 1896). The genitalia of this specimen have not been examined.

The species is not so common as *statices*, but is locally distributed in England and is also found on the limestone in North Wales.

Procris (Jordanita) globulariae Hübner

Sphinx globulariae Hübner, 1793, *Vögel und Schmett.*, p. 12, pl. 67.

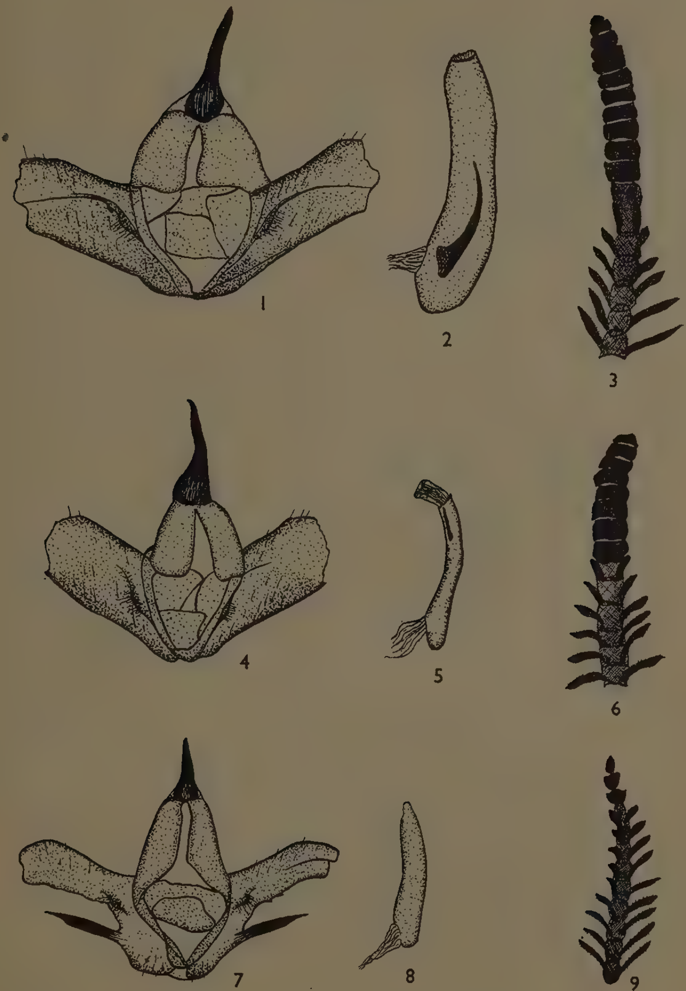
Procris cognata H.-S., Jordan *nec* H.-S., 1907, in Seitz, *Macrolep.*, **2**: 8.

Procris acanthophora Agenjo, 1937, *Eos*, **12**: 302.

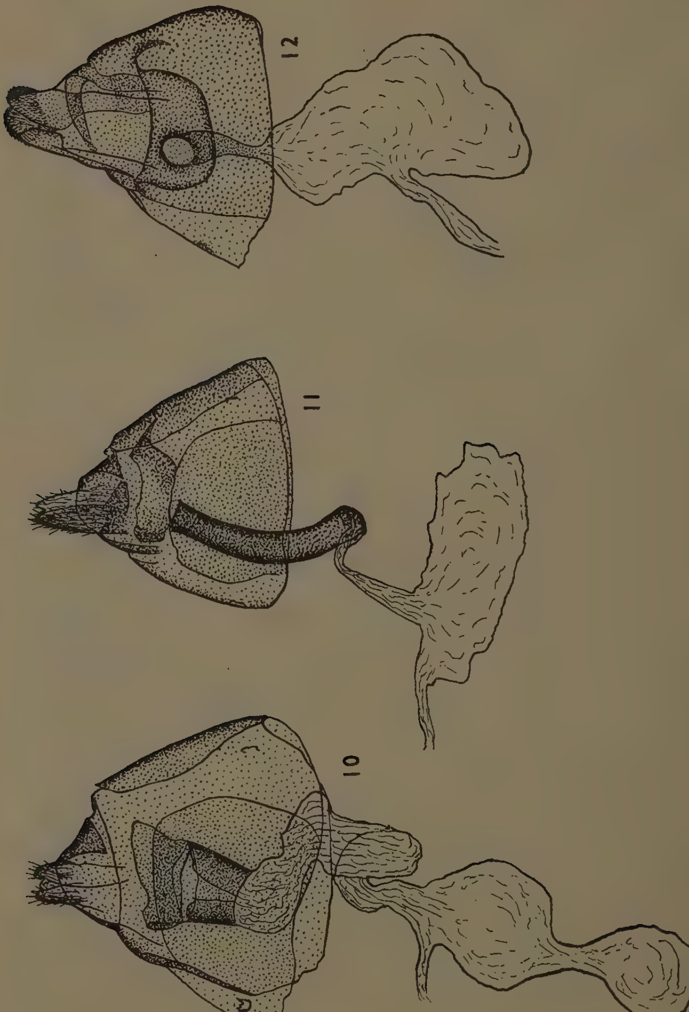
Procris cognata H.-S., Agenjo *nec* H.-S., 1937, *Eos*, **12**: 302.

This species was first recorded as British in 1845 by J. J. Weir (1845), who took specimens on the Downs near Lewes in Sussex. It is rather local and the rarest of our three species, occurring in Kent, Surrey and Sussex, spreading westwards to Wiltshire and the Cotswolds in Gloucestershire. It has been recorded from Cumberland, Warwickshire, Yorkshire and Merioneth, but these records need confirmation.

The larva feeds on the leaves of Black Knapweed (*Centaurea nigra* L.), and will also eat Greater Knapweed (*C. scabiosa* L.).



Figs. 1-9: *Procris* spp. (1) *statices* L., male genitalia. (2) *P. statices* L., aedoeagus. (3) *P. statices* L., male antenna. (4) *P. geryon* Hübn., male genitalia. (5) *P. geryon* Hübn., aedoeagus. (6) *P. geryon* Hübn., male antenna. (7) *P. globulariae* Hübn., male genitalia. (8) *P. globulariae* Hübn., aedoeagus. (9) *P. globulariae* Hübn., male antenna.



Figs. 10-12: *Procris* spp. (10) *statices* L., female genitalia. (11) *P. geryon* Hübn., female genitalia. (12) *P. globulariae* Hübn., female genitalia.

The moth flies in the sunshine in its favoured haunts during June. According to Jackson (1959) there is a night flight of the males between 11 p.m. and midnight. It is perhaps of interest to note that I have observed the males of *statices* flying in the evening between 7 and 9 p.m. The weather at the time was hot and sultry.

For nearly fifty years there has been considerable controversy over the correct identity of *globulariae* Hübn., which could not be conveniently settled, as the type could not be found in Hübner's collection in Vienna. It began when Jordan (1907) considered the species known as *globulariae* to be *cognata* H.-S. Since that date there have been two schools of thought, and to settle the question I erected a neotype in 1959, choosing as *globulariae* the species with the long spine at the base of the valve in the male genitalia (Tremewan, 1959).

Cockayne considered that the name *viridis* Tutt should be used for the species, but this name has no claims to nomenclatural status.

Buckler (1886) figured green larvae which he considered were *globulariae,* but it is obvious that these larvae, which he received from the Continent, were another species. The larvae of *globulariae* are brownish, with white along the dorsal area.

According to Tutt (1899), who referred to Hübner's figures in *Sammlung Europäischer Schmetterlinge,* the typical form is golden-green. However, Hübner's figure of 1793 is dark green, but it is possible that the pigment has deteriorated and changed with age. Hübner's figure of the female in his *Sammlung Europäischer Schmetterlinge* of 1803-1806 is golden-green, and in the description in this work he gives 'gelbgrun'—yellowish-green, which suggests golden-green. Specimens that are bright green are ab. *viridis* Tutt.

The male genitalia differ greatly from those of *statices* and *geryon* in having a long spine at the base of the valve, and the aedoeagus has no cornutus (Figs. 7 and 8). A conspicuous character in the female genitalia is the circular ostium (Fig. 12). The male antenna is bipectinate, with a pointed apex (Fig. 9).

REFERENCES

BUCKLER, W., 1886. *Larvae of British Butterflies and Moths,* **2.**
EDMUNDS, A., 1860. *Ent. wkly. Intell.,* **7**:196.
JACKSON, R. A., 1959. *Entomologist,* **92**:111.
JORDAN, K., 1907, in Seitz, *Macrolep.,* **2**:8.
TREMEWAN, W. G., 1959. *Entomologist,* **92**:116.
TUTT, J. W., 1899. *Brit. Lep.,* **1.**
WEIR, J. J., 1845. *Zoologist,* **3**:1085.

A COMPARISON OF THE LIFE-HISTORIES OF TWO SPECIES OF *ORNITHOMYIA* (DIPT., HIPPOBOSCIDAE)

By G. B. Corbet *
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From July, 1954, to October, 1955, starlings (*Sturnus vulgaris* L.) were trapped in large numbers at a sewage farm at Romford, Essex, by Mr. R. Spencer. They were examined for ectoparasites by means of a Fair Isle chloroform apparatus (Williamson, 1954), and Mr. Spencer kindly allowed me to examine the Hippoboscid flies obtained in order to compare them with those whose life-history I had already studied in some detail on Fair Isle, Shetland (Corbet, 1956a, 1956b). These Fair Isle flies were entirely *Ornithomyia fringillina* Curtis (= *O. lagopodis* Sharp if these two forms are considered to be specifically distinct).

Trapping at Romford was carried out on most week-ends throughout the period. All but four of the birds trapped and examined during the period when flies were present were juveniles. The four adults were free of flies, and therefore all the positive records that follow refer to juvenile birds. The total number of flies obtained was 152, all of one species, namely *Ornithomyia avicularia* (L.). This species is confined to the southern part of the British Isles, whereas *O. fringillina* is widespread (although apparently absent at Romford). Since the two species are sympatric over much of their range a comparison of their ecology is of considerable interest.

SEASONAL INCIDENCE

The seasonal distribution is shown in Table 1 (first four lines) along with strictly comparable data from Fair Isle. At Romford the pattern is rather different in the two years. In 1954 the infestation showed a maximum in late July, dropped very sharply by early August, but thereafter remained level before falling off gradually in September. The last flies were obtained on 24th October. Only five birds (two of them adult) were trapped on 31st October, which does not constitute an adequate negative record, but 68 and 49 birds were trapped during November and December respectively and all were devoid of flies.

In 1955 spring trapping was adequate to show that flies were still totally absent in May (87 adults, 17 juveniles and 3 nestlings examined). Trapping on 4th and 5th June also proved negative (3 adults, 12 juveniles). The first fly (a single female) was found on 14th June. They remained scarce until July when infestation gradually rose to a peak in the middle of the month, dropped again, and then rose to a higher peak in mid-August. However, this maxi-

* Now at *British Museum (Natural History)*.

Table I. Seasonal incidence of *Ornithomyia* on starlings at Romford and Fair Isle.

			June		July		August		Sept.		Oct.	
Flies per bird examined	1954	R	—	—	0.24	1.17	0.44	0.46	0.45	0.38	0.12	0.19
		FI	—	1.10	1.25	1.65	1.96	0.50	0.43	—	—	—
	1955	R	0.03	0.09	0.14	0.48	0.38	0.67	0.24	—	—	—
		FI	—	2.86	2.72	2.00	1.03	0.92	0.57	—	—	—
Percentage with wings damaged		R	—		5%		25%		16%		7%	
		FI	18%		51%		62%		3/4		—	
Percentage of male flies		R	—	—	17%	22%	1/8	21%	6%	7%	0	—
		FI	—	40%	50%	41%	47%	22%	0/5	—	—	—
Percentage of females gravid		R	—		23%		42%		37%		36%	
		FI	48%		42%		45%		3/6		—	

R —*O. avicularia* from Romford, Essex. FI—*O. fringillina* from Fair Isle, Shetland.

mum (0.67 flies per bird examined) was little more than half the maximum in 1954. Data from the autumn of 1955 is not available for a detailed comparison with that of 1954.

Comparing these results with the data for *O. fringillina* on Fair Isle (for the same two years), the overall degree of infestation is seen to be much smaller at Romford. The Fair Isle flies showed two maxima in 1954, in late July and early August, but these are too close together to appear in the figures in Table I. The second (and higher) peak was conclusively attributed to the emergence of the second brood of young starlings. The 1955 figures for Fair Isle show quite a different pattern, namely a progressive decrease from an initially very high degree of infestation in late June. Whilst the 1954 figures show some similarity between the two localities, those of 1955 are totally different.

In both years, but particularly in 1955, the main difference is in the later appearance of flies at Romford in spite of the earlier breeding season of the birds. On Fair Isle the first broods of starlings do not appear until late June and are fairly heavily infested from the start, whereas at Romford they appear in late May but are not heavily infested with flies until July. A further difference is in the very slow decrease in infestation at Romford after the August peak, small numbers of flies persisting well into October. The proportion of flies showing damage to the wings also shows a different pattern from that at Fair Isle. The damage is considered to be almost entirely due to preening. At Fair Isle the percentage damaged rose continuously during the season, whilst at Romford it remained low.

SEX RATIO AND REPRODUCTION

The sex ratio, shown also in Table 1, differs markedly from that of *O. fringillina* on Fair Isle, where the proportion of males was about 50 per cent throughout July and then fell off steadily to reach zero by September. At Romford the proportion of males was never greater than 22 per cent but also decreased to reach zero by October.

The only measure of reproductive activity observed was the proportion of females which were gravid. These figures are shown on a monthly basis in Table 1 since the numbers of specimens were rather small. However, half-monthly treatment does not reveal any additional fluctuations. The value is on the whole similar to that in *O. fringillina* on Fair Isle, where it fluctuated around a mean of 42 per cent throughout the season. However, the low initial value of 23 per cent in July at Romford has no counterpart in the Fair Isle data.

PHORESY

On Fair Isle 43.5 per cent of all flies from starlings carried one or more specimens of the specific feather louse *Sturnidoecus sturni* (Schrank). This same species of louse was abundant on the starlings at Romford, and yet only two cases of phoresy with lice were found

amongst the 152 flies examined. These were both collected on 19th July, 1955, and in each case involved one louse (*S. sturni*) attached to the abdomen of a female fly.

There appears only to be one previous record of this species of louse on *O. avicularia* (Thompson, 1934), but it may be significant that it was in Shetland, where *O. avicularia* is only a rare vagrant brought by migrant birds. The starling was presumably a bird of the local resident race *S. v. zetlandicus*. However, other species of lice have been frequently recorded from *O. avicularia,* mostly species of *Brüelia* (e.g. by Ash, 1952).

Two possible explanations of this remarkable difference present themselves: (*a*) The life-history of *O. avicularia* may be such that there is no advantage to the lice in using them. This is most unlikely since both species are fully winged and there is absolutely no reason for supposing that *O. avicularia* does not occasionally change hosts in the same way as *O. fringillina* is known to do (Corbet, 1956b). (*b*) The habit of using *Ornithomyia* in this way may have arisen in the local population of *Sturnidoecus* on the Shetland starlings (which have themselves been sufficiently isolated to evolve subspecific characters). This seems a more likely, albeit still tentative explanation. Information on the incidence of *Sturnidoecus* on *O. fringillina* from English starlings should solve this particular problem.

In addition to phoresy of Mallophaga on the Fair Isle population of *O. fringillina,* three species of mites were frequently found attached to flies. Details of these have not yet been published. Only one species, *Microlichus avus* (Trouessart), was characteristic of flies from starlings. (*M. uncus* Vitzthum was characteristic of flies from rock and meadow pipits, *Anthus spinoletta* and *A. pratensis,* and a larger as yet unidentified species was found mainly on flies from the wheatear *Oenanthe oenanthe.*)

At Romford both species of *Microlichus* were found and also two others, namely *Myialges anchora* Sergent and Trouessart, and *Acarus siro* L., as follows:

1. *M. avus.* Only four flies were infested, i.e. 2.6 per cent. The numbers of mites concerned are 30 (4.vii.54), 1 (31.viii.54), 3 (9.vii.55), and 14 (21.viii.55). This situation is in sharp contrast to that on Fair Isle, where the proportion of infested flies (from juvenile starlings) was 90 per cent in the newly fledged birds, falling sharply to zero within a month. This applied to both broods. In both collections only females were present, on the abdomen, wing-bases and parascutellar grooves of the thorax, but eggs were never present. On Fair Isle up to 400 mites were found on one fly and more than 100 was common.

2. *Microlichus uncus.* At Romford only three flies carried this species, although unaccompanied eggs or egg-shells were found on eight others. In 1954 one fly on 1st August had four mites associated

with 52 eggs and six empty shells. Thereafter only eggs or empty shells were found on five flies in September. Likewise in 1955 the September records (four) were of egg-shells only. On the Fair Isle starlings the situation was similar (2 per cent. of the flies infested), and these flies were considered to have come from pipits, on whose flies *M. uncus* was much more frequent (6-11 per cent). The eggs were always under the wing near the base.

Both these species of *Microlichus* have been previously recorded on both species of *Ornithomyia* (Ash and Hughes, 1952), but the consistent absence of eggs in infestations of *M. avus* does not seem to have been noticed.

3. *Myialges anchora.* Only one record of this species was found at Romford, and none at Fair Isle. A female fly on 16.ix.55 had five female mites attached to the abdomen. Three of these had beside them 8, 5 and 3 eggs respectively. Bequaert (1953, p. 145) quotes records of this mite mostly from the pigeon fly *Pseudolynchia canariensis* (Macquart) (which does not occur in the British Isles), and also from *O. fringillina,* but there appears to be no previous record from *O. avicularia.*

4. *Acarus siro.* Only one record was obtained at Romford and none at Fair Isle. A single specimen was found on the abdomen of a female fly on 18.ix.54. There appear to be no previous records of this species being carried by Hippoboscid flies.

All four species of mite are sufficiently rare on the Romford flies to make it quite possible that the flies concerned had come from other species of birds on which the infestation of mites was greater. This is the most likely situation with *M. uncus* and *M. anchora.* The *A. siro* may have a similar origin, or more likely its presence on the fly was quite fortuitous. The case of *M. avus* is more puzzling in view of its great abundance on the Fair Isle flies. Although the first brood fledglings appeared too early at Romford to be infested by flies, the birds of the later broods should have shown highly infested flies if the situation had been similar to that on Fair Isle. However, until more is known of the incidence of these mites on the birds themselves little can be done to explain the difference in infestation on the flies.

CONCLUSIONS

O. fringillina, although apparently absent from the Romford area, is in general sympatric with *O. avicularia* in England, whereas at Fair Isle (and most of Scotland it seems) *O. fringillina* is the only species present, apart from vagrants carried by migrant birds. One would therefore expect to find some differences in life-history or ecology between the two species. There are in fact sufficient differences between the Romford collection of *O. avicularia* and the Fair Isle collection of *O. fringillina* to suggest the presence of specific differences in the life-history, but the adaptive significance of these

is obscure, and the possibility of alternative explanations should be considered. Neglecting phoresy for the moment, the principal differences to be explained are the late appearance of flies at Romford, the small proportion of males, the small proportion with damaged wings, and the low initial proportion of gravid females in July.

The late appearance (or more correctly late abundance) of flies could be due, not to late emergence, but to absence of newly emerged flies locally, and subsequent acquisition from a distance. In this connection it is interesting that the young birds which have been bred on the sewage farm and in the adjacent suburban area at first roost locally, but later in the summer move further afield, roosting at a gravel pit, and finally in the autumn moving long distances to roost. The puparia fall to the ground when laid, and therefore undisturbed ground is essential for their survival until the following summer. Suburban terrain is obviously unsuitable for survival, and even at the sewage farm their main feeding localities, i.e. on the filter beds, are equally unsuitable. We therefore have a very limited area of available wintering ground for puparia, occupied by an extremely large population of birds, so that the average degree of infestation is bound to be slight. Absence of flies in suburban and arable districts has been previously noticed in Scotland (Corbet, 1956b, p. 419).

This progressive extension of their range for roosting purposes therefore accords very well with the progressive increase in infestation and the slow autumnal decline. The situation is therefore not comparable with that on Fair Isle, where the birds were confined to a small island of fairly uniform habitat. Previous records of the two species from England are scattered, but there appears to be no tendency for *O. avicularia* to emerge later than *O. fringillina*.

The difference in sex-ratio cannot be completely explained along the same lines. At Fair Isle the males were shorter-lived than the females, so that the proportion of males began to decline about six weeks after their first appearance. If the emergence at Romford (or at least in the roosting areas) is in fact in late May (i.e. coincident with the appearance of the fledglings), then one would expect the sex-ratio to be falling by July, but one would also expect the decline to continue throughout July and August. In fact, it does not fall further until September. This suggests that there may be a second generation of flies emerging in July and August (i.e. from puparia laid by the flies of the first emergence). On Fair Isle there was no evidence of a second generation of flies, although large numbers of puparia were kept. Ash (1953) kept puparia of *O. avicularia* and found that none emerged until the following spring and summer, but the number involved was small and the earliest was laid on 1st July.

The hypothesis that it is in fact double brooded to some extent

is supported by the small proportion of damaged individuals throughout the summer at Romford. The low initial value for the proportion of gravid females could be correlated with the general scarcity of flies at that time, and consequent lack of opportunity for mating.

It can therefore be said that these collections give no evidence of differences in life-history apart from the probability of a second generation of *O. avicularia* at Romford. However, data for southern populations of *O. fringillina* is not sufficient to show whether or not the same applies to it. Since no specimens of *O. fringillina* were obtained at Romford, and since no birds other than starlings were examined in numbers, no further light can be shed on the question of host preference where the two species overlap. However, a recent collection of both species from Oxfordshire (Ash and Monk, 1959) showed song thrush and blackbird (*Turdus ericetorum* and *T. merula*) to carry *O. avicularia* only, and most of the smaller birds mainly *O. fringillina*. Size may therefore be important.

The mortality of *Ornithomyia* spp. is almost entirely from three causes: (*a*) adult mortality by preening; (*b*) pupal mortality due to unsuitable ground (roads, water, etc.); (*c*) pupal mortality by predation (mice, shrews?). Of these only the first (preening) is likely to be density-dependent, and therefore competition between the two species will only be manifest while they are on the birds, and will presumably result in differential mortality because of the difference in size (*O. avicularia* is the larger) and possibly in activity. It is likely that this competition is avoided by some form of host-selection, and more information is required on this point before the habitat distribution can be explained. It seems to be a general observation that *O. avicularia* is absent from moorland habitats even in England. The situation in equally undisturbed but woodland habitats is not known.

ACKNOWLEDGEMENTS

I wish to thank Mr. R. Spencer for allowing me to examine the flies and for supplying the necessary collecting data; and Dr. G. O. Evans and Dr. Theresa Clay of the British Museum (Natural History) for identifying the mites and lice respectively.

REFERENCES

ASH, J., 1952. Records of Hippoboscidae from Berkshire and Co. Durham in 1950, with notes on their bionomics. *Ent. mon. Mag.*, **88**:25-30.
1953. Notes on the puparial stage of some Hippoboscidae. *Ent. mon. Mag.*, **89**:206.

ASH, J. & HUGHES, T. E., 1952. Further records of the genera *Microlichus* Trouessart and Neumann, and *Myialges* Sergent and Trouessart. *Ann. Mag. nat. Hist.*, **12**, v.:753-9.

ASH, J. & MONK, J. F. A collection of *Ornithomyia* spp. (Dipt., Hippoboscidae) from Oxfordshire. *Ent. mon. Mag.*, **95**:80-1.

BEQUAERT, J., 1953. The Hippoboscidae or louse-flies (Diptera) of mammals and birds. Part I. Structure, physiology and natural history. *Ent. Amer.* (n.s.), **32** & **33**:1-442.

CORBET, G. B., 1956a. The phoresy of Mallophaga on a population of *Ornithomyia fringillina* Curtis (Dipt., Hippoboscidae). *Ent. mon. Mag.*, **92**:207-11.
1956b. The life-history and host-relations of a Hippoboscid fly *Ornithomyia fringillina* Curtis. *J. Anim. Ecol.*, **25**:403-20.

THOMPSON, G. B., 1934. The parasites of British birds and mammals. I. Notes and records. *Ent. mon. Mag.*, **70**:133-6.

WILLIAMSON, K., 1954. The Fair Isle apparatus for collecting bird ectoparasites. *Brit. Birds*, **47**:234-5.

COLIADS IN 1960

I observed, and took, all three British species of *Colias* in 1960. On about 13th and on 20th July a few specimens of the Pale Clouded Yellow (*Colias hyale* L.) were flying in clover fields on the slopes of the downs south-east of Salisbury, Wilts: one of the fields being the identical one where I had taken the species in 1955. Three specimens (two males and one female) were taken on the latter date mentioned (20.7.60).

On 23rd August I saw what I at first thought to be a var. *helice* of the Common Clouded Yellow on the downs above Polruan in S. Cornwall. It wasn't until I appreciated the wild and rapid flight that I proceeded to take it. It then turned out to be a female specimen of *Colias australis* Verity (Berger's Clouded Yellow). This specimen was shown at the South London Society's Exhibition on 29th October, 1960. I saw none other such, or indeed any other *Colias*, during the fortnight I was at Polruan, although the weather was most favourable.

On 10th September, while making the long ascent of Brown Willy on the Bodmin Moors, I saw, at about 1 p.m. B.S.T. and at an elevation of about 1,100 feet, a female specimen of *Colias croceus* Fourc. (Common Clouded Yellow) flying rapidly along the stiff south-east breeze. I caught it after quite a chase. The only other specimen of this species seen in Cornwall was a male on the following day at Port Isaac on the north coast: also apparently taking advantage of the wind, but flying westward along the cliffs as soon as it reached them (12 o'clock). The weather was very favourable also during my fortnight at Port Isaac.

I may add that on the summit of Brown Willy (1,375 feet) on the date indicated, in hot sunshine, there were flying very numerous *Vanessa atalanta* L., some *Pararge megera* L., and one *Coenonympha pamphilus* L. Incidentally, on the way up I saw a Montagu's Harrier.

There was the usual small flight of *croceus* in my own grounds at Burnham in September and October.

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A SPECIES OF *HYDROPTILA* (TRICHOPTERA) NEW TO BRITAIN

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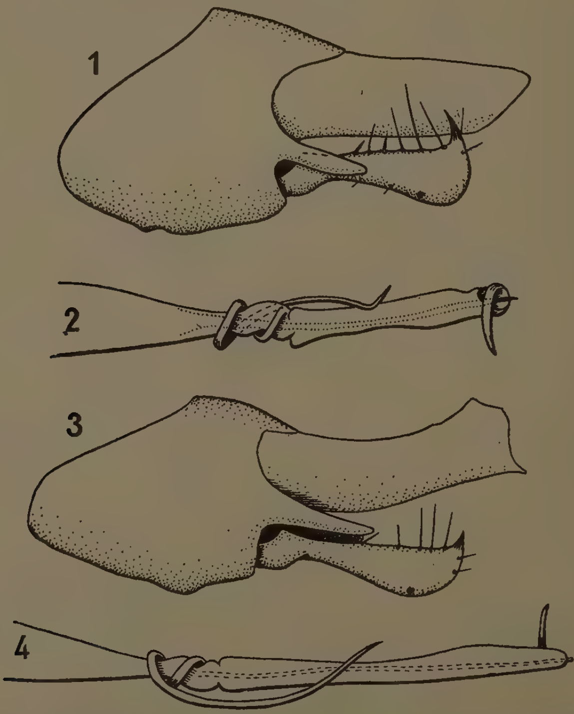
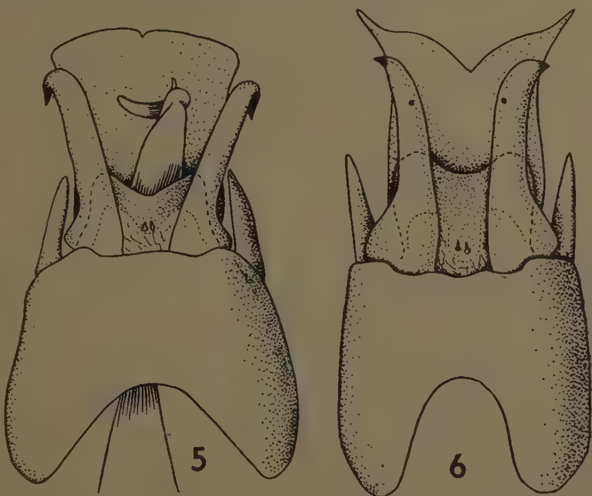
Amongst a small collection of Trichoptera taken in a light-trap at Hampton Bishop, R. Wye, Herefordshire, 12th August, 1959, by Mr. C. M. H. Harrisson, I was interested to find a number of Hydroptilas, the males of which resembled *Hydroptila cornuta* Mosely, but differed in the details of the genitalia. Examination of preparations has revealed them to be *Hydroptila lotensis* Mosely, described about thirty years ago from Cahors, on the R. Lot, France, and subsequently found also in Roumania.



Figs. 1-4: *Hydroptila lotensis* Mosely (1-2) and *H. cornuta* Mosely (3-4), ♂ genitalia and aedeagus, lateral.

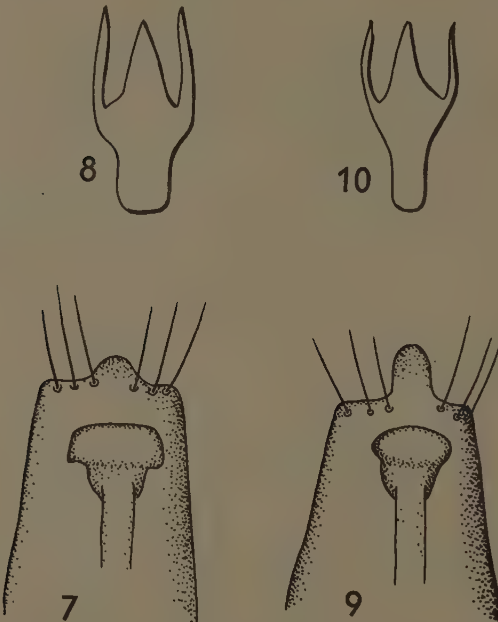
The figure of the male genitalia of *H. cornuta* in Mosely's *British Caddis Flies* (at his request) rather exaggerates the small black wart on the lower edge of the male claspers and, in my opinion, gives a somewhat misleading impression. Nielsen (1951, *Folia limnolog. Scand.*, **4**: 125) has already commented on this inaccuracy, and I am therefore re-figuring *H. cornuta* for comparison with *H. lotensis*, and it will be seen that the difference between the claspers of the two species is less than the figure in Mosely would lead one to believe. The chief difference in genitalia lies in the form of the tenth segment (dorsal plate), which in *cornuta* is rather 'fish-tailed' apically with acute lateral angles and in *lotensis* is slightly convex apically, with rounded angles and only a small median excision. The apical claw of the clasper is longer and more recurved in *lotensis*. The aedeagus appears to differ chiefly in the relative length of the apical portion beyond the spiral titillator, being shorter and stouter in *lotensis* than in *cornuta*. The position of the spiral titillator and apical hook should be disregarded, since the aedeagus appears capable of some degree of rotation on its longitudinal axis.



Figs. 5-6: *H. lotensis* Mosely (5) and *H. cornuta* Mosely (6), ♂ genitalia, ventral.

The specimens being in fluid, it is difficult to give a detailed description of the general appearance. The fore wings are dark fuscous with a faint trace of a pale transverse band about midway and a pale spot on costal margin in apical fourth. Antennae pale, banded with fuscous about midway and towards apex. Scent-organ caps on

head of male fuscous, resembling an acorn in its cup, scent organ consisting of a single filament.



Figs. 7-10: *H. lotensis* Mosely (7-8) and *H. cornuta* Mosely (9-10), eighth sternite and apparatus vestibularis (trident) of ♀, ventral.

♂ Genitalia. Ninth segment produced dorsally in a triangle, side-pieces slender, digitate. Tenth segment forming the usual semi-membranous hood (dorsal plate), extending beyond the claspers, in dorsal view more or less parallel-sided, apex slightly widened, apical angles rounded, apical margin convex, with a small median excision. Aedeagus of the usual *Hydroptila pattern,* with a curved hook set transversely at apex and a single spiral titillator. Clasper resembling that of *cornuta,* but slightly more dilated apically, upper apical angle produced in an acute, somewhat recurved hook. Lower margin with a small blackened wart as in *cornuta.* Above the base of the claspers is a thin plate, its apical margin more pigmented and widely excised. In the centre of the plate on the lower surface are two short, stout spinules. In *cornuta* this plate is more widely pigmented and with a more rounded excision.

Length of fore wing, 2.8 mm.

♀ Genitalia follow the pattern of the *sparsa* group. Ventral process of the sixth sternite short and acute. Apical margin of the eighth sternite produced at its centre in a short, rounded lobe. Chitinized plate of eighth sternite somewhat quadrangular and transverse apically. Apparatus vestibularis trident-like, the outer arms longer than the centre. Base rather short and broad.

The female of *H. lotensis* differs from *H. cornuta* in the shorter and broader apical lobe of the eighth sternite, the more quadrate chitinized plate and the longer outer arms of the trident.

The capture of these specimens by Mr. Harrisson brings up to six the number of species of Trichoptera discovered in this country during the twenty years that have elapsed since the publication of Mosely's *British Caddis Flies* and suggests that even now we may not have reached the final total.

REFERENCES

MOSELY, M. E., 1930. New European Trichoptera and Plecoptera. *Trans. ent. Soc. Lond.,* **78**:237-253.

1939. *The British Caddis Flies*. G. Routledge & Sons, Ltd., London.

VANESSA ATALANTA L. (LEP., NYMPHALIDAE) IN THE ARAN ISLANDS

As 1960 was a year of very few migrant Lepidoptera records, it may be of interest to record the occurrence of great numbers of *V. atalanta* in the Aran Islands. While collecting in the vicinity of Kilmurvey Bay on the 15th, 16th and 17th of September many specimens were seen each day. The greatest concentrations being found on ivy in sheltered places, as many as one hundred specimens being counted in an area of one by four yards. Over the remainder of the island (Inishmore) this butterfly was generally distributed. Other specimens which were common included *Aglais urticae* L. and *Pieris brassicae* L.

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THE LARVA OF *DRUSUS ANNULATUS* STEPHENS (TRICHOPTERA: LIMNEPHILIDAE)

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On 12th May, 1954, thirty-two larvae were collected from a small stream which comes out of the Blue Pool at Bradfield, near Reading. The larvae were found underneath the stones, burrowing into the sandy bottom. This was the first record of this species in the Reading area. The Berkshire larvae were checked against many specimens collected by Mr. Arthur Peacey and myself from the River Forme in Gloucestershire, where Mr. Peacey had formerly collected the adults, and also against larvae which were hatched from an egg mass, which I found on 8th February, 1955, beneath a stone in the small stream at Bradfield. The larvae hatched out in the laboratory on 23rd February. Many larvae were reared to the pupal stage and, by dissecting away the pupal integument, the underlying imaginal genitalia were made out and the identification of the species was confirmed as *Drusus annulatus*. The following details are derived from the study of fully-grown specimens.

Case

The cases are up to 14 mm. long and 3.5 mm. wide and are made of sand grains and small stones. The cases are curved and taper towards the posterior end. The anterior opening of the case is oblique and the posterior opening is small and straight.

Larva

The larva is eruciform. The larvae examined were up to 12 mm. long and 2 mm. wide.

Head

The head is hypognathous, short and broad. The frontoclypeus is dark brown, has four long setae which are black, and two which are colourless, all situated at its oral part. In addition, there are two setae at the constrictions of the frontoclypeus. The anterior surfaces of the genae are dark brown except for two yellowish-brown areas surrounding the eyes. The posterior surfaces of the genae are chestnut brown and have no dark spots. The gular sclerite is broader at its oral part and is chestnut brown. The genal suture is open.

Labrum

The ventral margin of the labrum has a protuberance, on each side of which there are five setae and a group of marginal hairs.

Mandibles

Each mandible has a hairy brush on its inner surface and two setae on its outer surface near the base. The upper end of the mandible is long and is similar to a blade.

Maxillae

The cardo is rod-shaped and bears a single seta. The stipes has two setae along its distal margin. The maxillary palp has five segments, of which the basal segment has many hairs. The lacinia has a few hairs and sensillae. One of the sensillae is long and has fine secondary hairs.

Thorax

The pronotum is dark brown, entirely sclerotized, and has a median longitudinal suture and a black, highly-sclerotized posterior margin. There are many setae on the anterior and lateral margins of the pronotum as well as on both sides of the median suture. The lateral margins of the pronotum are noticeably convex. The prosternal horn is present. The mesonotum is sclerotized except for its margins. Its posterolateral and posterior margins are highly sclerotized and are black in colour. The sclerotized area is chestnut brown. The mesonotum has many setae on the anterolateral corners and on the chestnut-brown part. The metanotum has six sclerites, each of which has many setae. There are many scattered setae on the metanotum.

Legs

The prothoracic leg is shorter than the mesothoracic and metathoracic legs, which are approximately equal in length. The second segment of the trochanters of the mesothoracic and metathoracic legs have a few hairs. All the tibiae have two spurs and a spine in between. The tarsal claw is strongly curved.

Abdomen

The dorsal protuberance on the first abdominal segment is devoid of setae, whereas each of the lateral protuberances has a small number of setae. There is a transverse row of setae on the tergum as well as on the sternum of the first abdominal segment. The gill filaments are single and are present on abdominal segments two to seven. The lateral line running from the beginning of the third to the beginning of the eighth abdominal segments is formed of fine hairs. The anal sclerite is elliptical, yellowish-brown, has four long setae, two medium setae and a few short setae. The anal appendage has two segments and the anal claw has an auxiliary claw at its base. The anal appendage is supported by a sclerite which has a prolongation extending on to the sternum of the tenth abdominal segment. There are two long setae and a short seta between the anal appendage and the supporting sclerite.

The larvae of *Drusus, Mesophylax, Halesus, Chaetopteryx, Stenophylax* and *Micropterna* have single abdominal gill filaments and therefore may be confused. The head and pronotum are dark brown and have no spots in *Drusus* and *Mesophylax*. The mesonotum of the former genus, however, is chestnut brown. The mesonotum of *Mesophylax* is dark brown except for two lighter spots at the posterior cor-

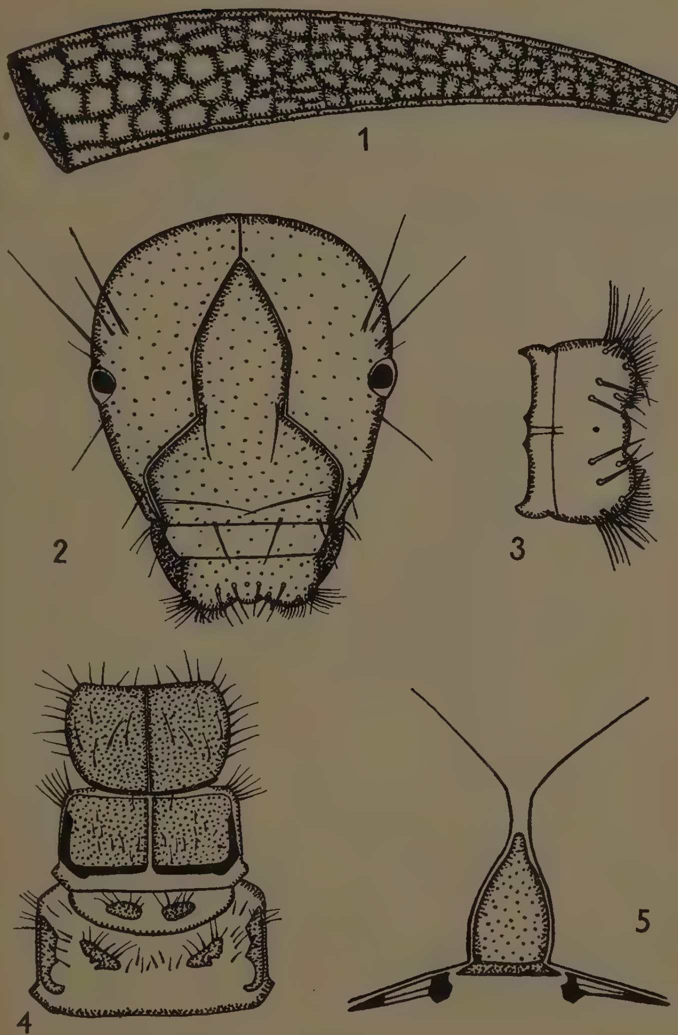
ners (Lestage 1921, Ulmer 1909). The head, pronotum and mesonotum have dark spots in *Halesus, Chaetopteryx, Stenophylax* and *Micropterna.* In *Halesus* the spots are distinct, fairly large, numerous and often fuse together, whereas they are much smaller in the other three genera. In *Chaetopteryx* the dorsal gills are present from the second to the sixth abdominal segments, while the lateral gills are present on segments one to four. In *Stenophylax* there are dorsal gills on the seventh and eighth abdominal segments, whereas the lateral gills are present until the fifth segment. Hickin (1953) pointed out that the larvae of *Micropterna* are more sclerotized than those of the allied genera.

REFERENCES

HICKIN, N. E., 1953. Larvae of the British Trichoptera: *Micropterna sequax* McLachlan. *Proc. R. ent. Soc. Lond.* (A) **28**: 163-165.

LESTAGE, J. A., 1921, *in* **Rousseau, E.,** *Les larves et nymphes aquatiques des insectes d'Europe.* Brussels.

ULMER, G., 1909. *Trichoptera, Die Süsswasserfauna Deutschlands,* **5-6**: 266-268.



LARVA OF *DRUSUS ANNULATUS* STEPHENS.
Figs. 1-5: (1) Larval case. (2) Head from the front. (3) Labrum. (4) Thoracic nota from above. (5) Gular sclerite.

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LARVA OF *DRUSUS ANNULATUS* STEPHENS.

Figs. 6-9: (6) Labium and maxillae. (7) Anal appendage, anal claw and supporting sclerite. (8) Left mandible. (9) Right mandible.

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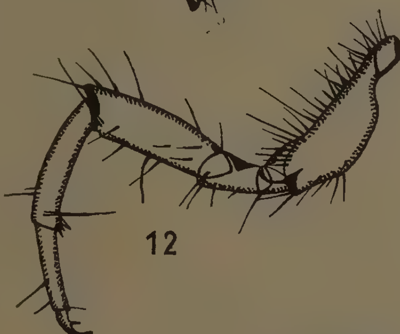

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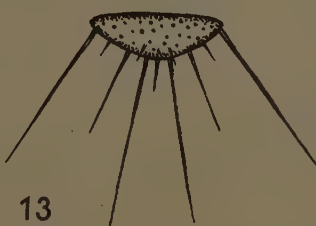

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LARVA OF *DRUSUS ANNULATUS* STEPHENS.
Figs. 10-13: (10) Prothoracic leg. (11) Mesothoracic leg. (12) Metathoracic leg. (13) Anal sclerite from above.

SOME NOTES ON THE ECOLOGICAL CONSEQUENCES OF VIRUS DISEASE IN *APATURA IRIS* LINNAEUS AND OTHER SPECIES

By I. R. P. HESLOP

It seems likely that, under the increasingly precarious circumstances of our native fauna, we are going to have to consider more and more the effects of virus disease on the Lepidoptera. I know nothing about the disease as such; but it has been possible for me to make some observations and draw certain conclusions, and so, with all diffidence, I offer these remarks.

Where a Purple Emperor larva has been reared from the ovum, or where the larva has been taken young enough, virus disease does not seem to constitute a problem of breeding in captivity. But in the case of a larva taken in its third or fourth instar, it is frequently a factor to be reckoned with; and in the natural state certain ecological consequences are becoming increasingly plain.

The only instance I know of a larva, so diseased, being successfully treated was when, as a measure of desperation, one was carefully bathed under a gentle flow from the cold-water tap. It recovered. I too have similarly successfully bathed a Purple Emperor larva, not to combat infection, but to free the larva mechanically from infestation of Green-fly with which it had become covered as a result of feeding on infested Sallow. In that year (1957) the Green-fly infestation of various shrubs and trees in Wiltshire and Somerset was unprecedented, and some *Salix* species were among the most heavily affected plants. In at least one instance infestation was simultaneous by both winged and mite-like instars.

But quite apart from the physical inconvenience it causes, I am fully convinced that some species of Aphid are vectors of virus disease. In 1957 disease hit some western colonies of *iris* severely, and in 1958 the effect was felt in Sussex and elsewhere. Quite apart from decimation of the stock, there were various unusual incidents which quite possibly sprang from the same cause. For example, an apparently not fully-grown larva, taken in Wiltshire on 30th May, 1957, pupated on 4th June; and, despite hot weather, the imago (a female rather below average in size) did not emerge until 23rd July—after the astonishing time of 50 days in the chrysalis. An ovum found in the same year was atrophied: another possible symptom of a generally pathological condition.

In some localities the disease may have started before 1957. I had already reported (1957, *Entomologist*, **90**: 186) on queer asymmetries observed in 1956. In my last paper (not yet published as I write this) I mentioned the most unusual case of a female caught in 1956 being found to be completely laid out. By a merciful provision of nature, females of all species of butterflies—I do not speak for any other group—are much hardier than the males. In conse-

quence, when an epidemic occurs, there is among the survivors a much larger proportion of females than under normal conditions. In the year just mentioned, 1956, female Purple Emperors were, over all, scarcely in a minority to the males—in contrast to the usual proportion of one to about five. I have had results of the same nature when attempting to breed affected stock of other species: in one case the useless extreme being reached of the survivors being females only.

But apart from the increasing of potential egg-laying capacity, by supply of the impulse to mate or lay more or both, what measures can Nature take to free a colony of any species from the menace indicated? One solution would be to 'get away'. Is this then one of the causes for movement of species with which we have become familiar since the First World War? That this is so in the case of the Purple Emperor I am quite certain. In Wiltshire I had observed local migrations of this species in 1942, 1952 and 1955; and there was another such in 1958. These moves were usually only between woods from four to seven miles apart, but they were probably sufficient for their purpose. But in 1952 there was also some migration on a larger and more sustained scale: including a re-colonisation of a limited area of the New Forest, and excursions into Somerset. The internal migration of *iris* is a feature that for the most part has escaped attention: but to myself and some of my colleagues in Wiltshire it has for some years been a vital and familiar reality.

I indicated also in my last paper that cold weather with a north-easterly air-flow has a cleansing effect on the hibernating larvae of *iris*: though probably the beneficial effects of a hard winter no longer off-set the consequent depredations of birds. Many specialists in the breeding of *iris* therefore place their cages during winter so as to face the north-east. But I think that this is not really necessary where pot-grown plants of sallow *which have been kept free from Aphis* are used. I myself keep my cages, not only in winter but in summer as well, at a window facing south (nevertheless where trees outside provide shade from the afternoon sun). Perhaps the heavy salt-laden winds of Burnham have a similar salubrious effect to that indicated! In that case, however, one would expect there to be localities here and there for *iris* in close proximity to the sea: but actually I know of none such anywhere on our coasts. The lost grounds near Lymington and Bridgwater, respectively, were probably the nearest such.

I have previously mentioned the deleterious effect of late frosts on larvae occupying bushes which give little protection. I take the opportunity of stating that it is necessary to distinguish between frost-bite and virus-infection, though mild lesions from the former might well admit establishment of the latter. Fatal frost-bite per se, on well-grown larvae, is distinguished first by a brown patch behind the head: this is followed by complete dissolution and deliquescence, as if the very structure of the body had broken up. Hibernating larvae are of course immune to frost-bite, unless they are exposed to frost immediately after being disturbed.

Nature has, moreover, another powerful line of defence. I think that in any case insufficient attention has been given to the reason for various species having alternative food-plants, often of quite diverse kinds. Here again I am sure that the fundamental reason for such provision is the furnishing of a means of *escape*.

Taking the Purple Emperor as a first example, the normal food-plants in this country generally are usually considered to be Broad-leaved Sallow (*Salix caprea*) and Narrow-leaved Sallow (*S. atrocinerea*). To these, in the experience both of myself and of some of my colleagues, must be added—apart from vagaries noted below—Common Willow (*S. alba*) and Lombardy Poplar (*Populus X*). Of the latter it may be remarked that the Purple Emperor likes it so much as a food-plant that a young Lombardy Poplar inside a covert is a certain draw for a find, even to the exclusion of neighbouring *S. caprea*; and further that it has attracted a laying female at a distance of over a mile from her native woodland. However, this hybrid tree is not yet sufficiently general in England to exert a considerable effect on the ecology of the insect.

In a certain wood in Wiltshire, with which I have long been familiar, the exclusive food-plant I had always found to be *S. caprea*; and yet in 1957, after a vain search of this plant, one larva was found immediately that attention was turned to *S. atrocinerea*. The small flight that year not only consisted of specimens below average (for the wood) in size, but was almost unprecedentedly early *in commencement*. Subsequently, when the virus infection was at its height, ova and larvae were found on other *Salix* species such as *S. babylonica* (Weeping Willow, in a cottage garden) and *S. viminalis* (Osier).

It should be borne in mind that transmission of virus disease is almost certainly not directly from the Aphids, but through the medium of plant juices. So that if the Aphids have been infesting one species only of food-plant, complete escape for Lepidoptera may be had by recourse to another.

It seems to me that in some respects my hypothesis may be inter-dependent with Gause's hypothesis (for which see, for example, *Entomologist*, **86**: 128, 1953). If two species of identical ecology cannot co-exist, it follows then that any one species may be able to 'get away' from inimical factors without there being the risk of having these restored or reinforced from another species which exactly shares its habits.

Emergence of the Purple Emperor brood is always in two phases, even where only one food-plant is used; but recourse to an *additional* food-plant is always to be suspected when emergence is found to be spread over an unusually long period of time, often with no perceptible break between the normal phases. This is likely to be through one species of food-plant coming into leaf much earlier than another.

What I am attempting to emphasize here is, however, not so much

augmentation of pabula, as the shift of a population from one species of food-plant to another. And here I think, so far as the Purple Emperor is concerned, that the possibilities of Aspen (*Populus tremula*) must be taken into account. This is a well-known food-plant on the Continent; but has not hitherto, I think, been recorded as such in England.

There is a certain wood in Wiltshire where *S. caprea* stock has for various reasons become very scarce. *Apatura iris* was believed still to be present, yet prolonged searching not only of the *S. caprea* but of the still abundant *S. atrocinerea* failed to reveal ova or larvae. I had already recorded the opinion that the *iris* stock had temporarily taken to the great brakes of Aspen. This year (1959) the imago was again seen in numbers in this wood: and in a neighbouring covert I for the first time saw a female ovipositing on Aspen. Incidentally, steps are being taken to restore the *S. caprea* in the wood in question.

It is my opinion that, for the health of the species and quite apart from any less spectacular variations of diet, *iris* must every now and again— perhaps once in seven or ten years—make for a year or two a mass shift in any typical locality to Aspen as a pabulum.

The potentialities of similar factors in other species come to mind. For example, in another Wiltshire wood the stock of the Comma (*Polygonia c-album* L.) at some date in the 'forties suddenly deserted the nettles as larval food-plant and took to Sallows: a marked temporary alteration in size and appearance of the imago resulted, but the species has some time since reverted to normal both in food-plant and in other respects. Also, it is my belief that, in the periodic lean years of disease following over-population, a colony of the Marsh Fritillary (*Euphydryas aurinia* Rott.) can save itself by recourse to the Marsh Valerian (*Valeriana dioica*) for laying.

But to my mind the most striking possibility in this connection is with regard to the Large Tortoiseshell (*Nymphalis polychloros* L.), which now probably is our rarest breeding butterfly, although at one time it was widespread and relatively common. The books quote as food-plants the Elm and Salix genera of species. It is my belief that this insect definitely required a periodic change from one plant genus to the other (though there are instances of other local preferences): and very few localities now provide the choice. There was the particular instance of a wood in Somerset which I may mention. When, in the 'thirties, the Large Tortoiseshell tried to stage a come-back, it took to this wood and flourished there, in a modest manner, for nearly twenty years. Larvae had at various times been taken there both on Ulmus and Salix. But when a very fine elm grove at one end of the wood was destroyed, the species disappeared; though, at that date, the Salix growth (the Sallows and Willow) remained as abundant as they had ever been.

'Belfield,' Burnham-on-Sea,
Somerset.

MISCELLANEOUS NOTES ON DIPTERA
I—TACHINIDAE and parasitic CALLIPHORIDAE

By R. W. J. Uffen

The nomenclature is that of van Emden (1954).

Actia frontalis (Macquart). I have two examples of this species which have no prosternal bristles, but bear a distinct postero-ventral spur on the hind tibiae. They were reared in May, 1956, from stems of *Circium palustre* (L.) from Bookham Common, Surrey, containing larvae of *Epiblema scutulana* (Schiff.). These specimens thus cut across two characters given in couplet 6(1) of van Emden's key to subfamilies of the Tachinidae. I have not reared further examples and am unable to state how frequently these abnormalities occur. The chaetotaxy of the Tachinidae is notoriously unstable, but its very variability provides a wealth of taxonomic characters.

Ocyptera interrupta (Meigen) was numerous amongst mixed vegetation between regenerating aspens at Ham Street, Kent, 14.vi.1958. The area is not far from the border of Sussex, from which county the species is better known. Smith and Bates (1956) record a male from Doddington, near Faversham, Kent, 1896.

Rhynchista prolixa (Meigen). One female was reared 1.viii.1958 from a larva ex fully-fed caterpillar of *Nephopteryx obductella* (Zell.) (Lep., Phycitinae) taken at Halling, Kent, 29.vi.1958. New host record, and apparently the first time that the species has been reared in Britain. Van Emden (1954) quotes a foreign record from a *Pyrausta* (Lep., Pyralinae).

Eriothrix rufomaculata monochaeta Wainwright is a common species on grassy waste ground, but its life cycle is still unknown. The foreign records quoted by van Emden (1954) may not be of regular hosts. It appears unlikely that so striking a species could parasitize any group of Lepidoptera commonly reared by amateurs and pass unheeded. This factor, together with the hosts of the closely related *Rhynchista prolixa* makes the author suspect *Crambus* as a possible host genus. Most *Crambus* species appear to hibernate whilst quite small, but the ubiquitous *C. hortuellus* (Hübn.) feeds up in the autumn. *E. rufomaculata* may oviposit too early to affect this species. These objections seem to apply equally well to most other groups of Lepidoptera with retiring larval habits, but the Hepialidae are an alternative worth investigation.

E. rufomaculata is ovoviviparous or larviparous, and many eggs develop simultaneously. One female, the base of whose abdomen was already empty, contained eighty larvae still contained in their egg membranes. Stimulated by dissection of the parent these larvae become very energetic and after a few minutes were able to move along the uterus. When this was torn apart the larvae moved rapidly across a microscope slide. They have a powerful cephalopharyngeal skeleton. The felt-chambers of the posterior spiracles are

about ten times as long as broad. There appears to be no sclerotization of the body surface to reduce water loss, but there are well developed bands of sclerotized flecks ventrally to assist locomotion.

Flies watched during the cold summer of 1958 spent hours simply sitting around or probing the flowers of thistles. Since the larvae develop in close succession in the female, larviposition presumably occupies only a short portion of a fly's life.

Parafeburia maculata (Fall.). I awoke on the morning of 22.vii.1957 at Brockenhurst, Hants, to find a female of this species running up and down the inside of my bedroom window. It was fascinating to see how much the living insect resembles a Sphecid wasp as it runs a few paces rapidly and stops, vibrating its wings at a small angle to the body, and then runs on again. The darkened apical half of the wings makes the fly look more substantial behind, creating a partial illusion of a wasp waist.

Van Emden (1954) gives the species as 'rare, generally distributed'. It is unlikely that even a migrant could fulfil this statement. As the late Dr. van Emden once remarked to me, 'rare' usually should read 'rarely taken', or perhaps 'strongly localized'. Thompson (1934) found *P. maculata* to be the commonest Rhinophorine larva in the 1843 woodlice which he dissected, making up 38 per cent of all the parasitic larvae. It is evident that most of these came from the localities which he enumerates in Buckinghamshire and Hampshire.

Thompson found that he could force development of both hosts and parasites by bringing the woodlice into a warm room in December, and providing plenty of food and moisture. Female woodlice bearing eggs appeared as early as mid-January, and flies emerged several months before appearing in the field. Taylor (1938) details his own forcing technique. Woodlice were kept in tin boxes at 55 deg.-60 deg. F. and were fed on sliced potatoes and sprinkled with water. He records rearing *P. maculata* amongst *Melanophora roralis* (L.) which emerged from February to April. Use of this simple technique in various parts of the country should lead to a better knowledge of the habitats and abundance of those woodlice parasites which are rarely taken as adults. It would then be possible to search for flies in localities where the larvae have been found and to determine why they normally evade detection.

Thompson found the level of parasitization to be only a few per cent in most cases, so the total number of flies in an area may appear to be small. The numbers of a gregarious woodlouse such as *Porcellio scaber* Latr., which seems to be the most heavily parasitized species, can however be much higher than appears superficially, since a 'colony' may be in reality only a roosting or feeding place in which a proportion of the more scattered local population is always found. The whole of this wider population becomes subject to parasitization even though the parasites oviposit only near the dense 'colony'. Cloudsley-Thompson (1953) showed the existence of very

large populations of woodlice by marking experiments at night on stone walls where only a small fraction of the population is abroad at any one time, and but a few small parts of it would be discovered by day.

Pachyophthalmus signatus (Meig.) is described by van Emden (1954) as rare and found only in the south of England. I have a male taken in my garden at Chiswick, Middlesex, 4.vi.1958. Andrewes (1955) states that the species is frequent in his garden at Finchley and records a specimen from Edgware.

Metopia leucocephala (Rossi). I have a male extracted from the clutches of a leaf of *Drosera rotundifolia* L. (sundew) on Chobham Common, Surrey, 27.v.1956. I have also a female from Thameside at Chiswick 24.vi.1956.

Blaesoxipha gladiatrix Pandellé is a parasite of adult grasshoppers. It is taken only infrequently. Van Emden (1954) says 'Surrey to Dorset, Berks, Middlesex, scarce', which may be the distribution of those who are prepared to go on their hands and knees with the flies and their hosts. Andrewes (1955) records a specimen from Edgware, Middlesex 30.viii.1953. I took an example at Chiswick, Middlesex, on 24.vi.1956 and had a more interesting encounter with the species on Ham Common, Surrey, on the afternoon of 30.ix.1956.

I stopped to watch some *Chorthippus parallelus* (Zett.) basking in the autumn sunshine on a bare patch of ground, and noticed two curiously sluggish Calypterate flies sitting, undisturbed by my movements, on the same patch of ground. I soon realized that each was closely following a female grasshopper, keeping about an inch behind her when she moved a few steps. Sometimes a more active male would cross the path of the shadowed female. If the female was in the way the male would crawl straight over her, but usually got unceremoniously kicked off before getting over the unco-operative obstacle. Sometimes these encounters left a fly following a male grasshopper. It would do so for no more than an inch before turning away and running after the female again, stopping an inch behind her as before. The males did not stridulate at this time, nor did it appear that subsequent activity of the males was what caused the flies to move away. After half an hour of this intriguing behaviour, movement slowed down as the sunshine lost its warmth, and it was evident that nothing further would happen that day. The flies were tubed, and both proved to be female *B. gladiatrix*.

The locality has not since been revisited under conditions propitious for these observations to be enlarged upon, but of three grasshoppers collected 27.ix.1958 for a record of their coloration, one, a female *Chorthippus brunneus* Thunberg, produced a *Blaesoxipha* larva a few days later. These chance encounters possibly indicate a higher percentage attack than is usual.

Richards and Waloff (1954) found larvae of *B. gladiatrix* by dis-

section, chiefly of *Chorthippus brunneus*, *C. parallelus*, and *Omocestus viridulus* (L.). Out of 90 parasitized grasshoppers only one was a nymph and one a male. It is now evident that this is because of the strongly selective shadowing behaviour of the fly, but what the fly responds to is not obvious. *C. parallelus* differs conspicuously in the two sexes because of the aborted wings, but this does not apply to the other hosts. Possibly the larger size of the females causes the males to be rejected if shadowing is normally so prolonged that the potential host crosses the path of others. Richards and Waloff found that marked male grasshoppers had a consistently higher life expectation than females, but there was a positive correlation of female longevity and mean mature weight, particularly in *C. brunneus*. This appears to rule out host longevity as the necessary strong natural selective pressure to produce such a well-defined preference as is demonstrated by Richards and Waloff's dissections.

REFERENCES

ANDREWES, C. H., 1955. Uncommon Calliphoridae (Dipt.) near London. *Ent. mon. Mag.,* **91**:27.

CLOUDSLEY-THOMPSON, J. L., 1953. A note on the littoral terrestrial arthropods of the Isle of Man. *Entomologist,* **86**:11-12.

EMDEN, F. I. van, 1954. *Handbooks for the Identification of British Insects,* **10,** 4 (a). R. ent. Soc. Lond.

RICHARDS, O. W. & **WALOFF, N.,** 1954. Studies on the biology and population dynamics of British grasshoppers. *Anti-Locust Bull.,* No. 17.

SMITH, K. G. V. & **BATES, J. K.,** 1956. Some records of *Ocyptera interrupta* Mg. (Dipt., Tachinidae). *Ent. mon. Mag.,* **92**:22.

TAYLOR, E., 1938. Some records of bred Tachinidae. *J. Soc. Brit. Ent.,* **1**:221.

THOMPSON, W. R., 1934. The Tachinid parasites of woodlice. *Parasitology,* **26**:378-448.

BOOK REVIEWS

Aëdes aegypti (L.). *The Yellow Fever Mosquito: its life history, bionomics and structure,* by Sir S. Rickard Christophers. Cambridge, 1960. Lge. 8vo. pp. xii; 739. Illustrated. Cloth. C.U.P. *Price £3 15s.*

Paradoxically enough this book is a reminder of how little we know about insects. It is also a reminder that almost all the insects of whose lives we have any detailed knowledge are those, comparatively few, whose activities bring them into direct contact, or in this case conflict, with man.

Although the book is primarily concerned with *Aëdes aegypti,* the title should not be interpreted too narrowly, as much of the information contained in it is applicable to mosquitoes in general. It is a highly comprehensive work, covering the structure and physiology of *A. aegypti* in all its stages, its distribution, predators, parasites, economic importance, and the measures taken to control it.

Any publication of this kind is bound to owe a great deal to the existing literature, a debt the author readily acknowledges: indeed, if the book was only a compilation of facts which are scattered throughout a vast entomological and medical literature it would be an impressive achievement. It is, however, far more than this for much of the information is original, being derived from the author's sixty years' experience of mosquitoes and their control. Here, for instance, is given the first detailed description of mosquito embryology and the structure of the brain.

The facts are presented in a systematic fashion, and the chapters are broken up into many sub-divisions which not only enhances the appearance of the text and make it easier to read, but also enables the reader to quickly locate any particular topic. The author has avoided the obvious pitfall of dwelling for too long on the economic importance of the insect, and the part covering medical aspects occupies only twenty-two pages. Very full bibliographies are given at the end of each chapter and are split up into appropriate sections.

The chapter devoted to techniques contains the most detailed and practical account of how to manage these insects in the laboratory, in which nothing is glossed over or left to the imagination. This is particularly welcome in a work of this calibre; so often authors assume knowledge of techniques which, though familiar to them, are apt to be obscure to a newcomer to research. It is a pity, and rather surprising in a book of such quality, that some of the figures, particularly in this section of the book, are unnecessarily crude and amateurish.

The book is intended primarily for the scientist, especially the research worker, and as such will find its place on library shelves rather than in the home of the private owner; indeed, the price puts it out of the reach of most amateurs. Nevertheless the book is

written in an easy, though scholarly style, and the chapters on historical aspects and techniques make absorbing and stimulating reading, even for those who are not particularly interested in mosquitoes.

A. EVE.

Common Malayan Butterflies, by R. Morrell. Published by Longmans, London. Illustrated in colour. *Price 12 6d.*

This admirable little book is the second of the Malayan Nature Handbooks edited by M. W. F. Tweedie, and is a worthy companion to the first. It will serve as an excellent introduction to the much larger and all embracing, and consequently much more costly volume on Malayan butterflies by Corbet and Pendlebury.

It consists of a list of the twenty plates figuring over one hundred species in colour, a very sensible and concise introduction of some sixteen pages, forty-two pages of text, and at the end a very complete index.

Though it has been written for the beginner, the text contains much information on habits, distribution, food-plants, etc., which the more advanced collector and lepidopterist will find of interest. The English names used by Evans in his 'Identifications of Indian Butterflies' are given, together with the scientific names, and this will help to accustom the beginner to the essential use of the latter.

The author is a very keen field lepidopterist and has himself bred many of the species mentioned. In certain cases, such as *Trogonoptera brookiana* and *Ypthima pandocus,* where the life history is still unknown, this fact is stated in the text to encourage the reader to try and breed these insects for himself and so increase our knowledge.

On the debit side there are few criticisms one can make. The colour plates, though not perfect, are sufficiently accurate for the purpose for which they are intended, though it is felt that space would have been saved and in consequence more species could have been figured, if those showing both upper and under sides had been combined as halves to make one figure. At the same time it would have been possible to illustrate the underside of every species and so give more information at no extra cost. There are singularly few errors in the text; in fact, the only noticeable one being the wrong use of 'cremaster' on page 17, line 8. It seems a pity that the pages opposite the plates are not numbered due to the space being taken up by the legends. If it was impossible to place the number in the correct position on the page, then it could have been included on the corresponding plate, e.g. Plate 1, facing page 12. Plates 9 and 12 are turned sideways, and consequently the plate number is out of place, only small points no doubt, which could have been avoided quite easily. It is fortunate that some indication of the size of the insects illustrated is made on the plates, but it might have been less confusing if instead of giving a scale of two inches on

some of the plates this had been omitted and the words 'Natural size' substituted, as on all the others where the insects are reduced in size a scale of three inches is given.

Apart from these very few minor points this book will certainly prove a very useful addition to many libraries, particularly those in universities and schools in the Malayan subregion, and will do much to promote the study of these fascinating and attractive insects.

T. G. Howarth.

Horticultural Pests—Detection and Control, by G. Fox Wilson. Revised by P. Becker, 1960. pp. xix + 240. Illustrated. Cloth. Crosby Lockwood & Son, Ltd. *Price £1 5s.*

Many a young entomologist just starting a collection of insects has found himself overwhelmed and discouraged by the enormous battery of lethal chemicals he is told he will need. This is probably true also of the budding horticulturist, and hence it is a pleasant relief to find a book on pest control which puts the emphasis first on prevention and secondly on cure.

Originally entitled *The Detection and Control of Garden Pests*, the book was written by a pioneer in the study of horticultural pests, who, like the author of the present revised work, was Entomologist to the Royal Horticultural Society. This, and the fact that among the host of books (and good books too), on this subject, a second edition was called for in two years, is a guarantee of its quality. The present revision is needed primarily because of recent advances in chemical insecticides, but opportunity has been taken to add new pests and many new illustrations, including 13 colour photographs. The book works on the principle of pest identification by recognition of the symptoms produced on affected plants, and is grouped into chapters dealing with root, stem, leaf, fruit, and seed, in their varied forms, showing the many ways in which a great variety of pests may disfigure or destroy them.

Dr. Becker has accomplished a very difficult task, that of revising an already well established and authoritative book, adding much that is new without destroying the character of the old. One cannot help feeling, however, that as specific names are included in the diagram on pages 18 and 19, they could be more accurate than they are. The specific name of *Carabus violaceus* is mis-spelt *violaceous*, and one wonders if the artist ever really saw specimens of *Staphylinus olens* or *Adalia bipunctata*, in both of which the tarsi, among other things, are wildly inaccurate.

All round, however, this is a first-class manual for the beginner and expert alike, and makes interesting reading for any entomologist who is curious to know more about the feeding and breeding habits of a great variety of insects, and such topics as toboggan traps for flea beetles.

A.E.

A Bibliography of British Lepidoptera, 1608-1799, by Arthur A. Lisney, M.A., M.D., F.R.E.S. Privately published. Printed at the Chiswick Press, London, 1960. pp. xviii; 315. 40 collotype plates. Limited edition of 500 copies bound in fine buckram. *Price £9 9s.*

This remarkable book is a monument to the scholarship and industry of the author. How it has been possible to amass and collate the incredible array of facts whilst engaged in a busy professional life in public health can be apparent only to those who have the privilege of knowing the author. The reviewer has had this privilege and has seen the book grow from an intention to publication.

The title is probably misleading, as it refers to only part of the contents, but to have found an adequate title would certainly have meant using one of cumbersome length.

The literature reviewed covers very nearly the first two hundred years of British Entomology in publications and takes in small references, such as Robert Hooke's *Micrographia,* and works concerned wholly with the British Lepidoptera.

Each edition has been carefully collated and differences are clearly defined.

Biographies of the authors are given, and wherever possible portraits are also included.

Several unpublished pages and plates are illustrated and throw much new light on the provenance and history of publication of works, the bibliography of which has hitherto been obscure or little known.

All this has been made possible only by the accumulation of a library as fine as will probably ever be found in private hands, and by the most exhaustive and painstaking research on copies and editions lying in libraries all over the world.

All this factual material could easily have been rendered dull reading, or its value nullified in an attempt to popularize its presentation. It is a further tribute to Dr. Lisney to say that, whilst this work will for ever remain an essential textbook for any enquirer into this extremely difficult branch of bibliography, it is a fascinating and absorbing mine of information for anyone interested in British Entomology, Biography—or just Books.

A word must also be said about the production. Eyre and Spottiswoode Ltd. (the proprietors of The Chiswick Press) have done full justice to the excellence of the contents by the very clear printing and a fine binding. The typeface is pleasant and the title page, in the opinion of the reviewer, one of the most beautiful seen in modern times, and a grand preface to a work which will give pleasure and instruction to many generations of entomologists yet to come.

E.W.C.

Annual Review of Entomology, Volume V, 1960. Annual Reviews, Inc. Palo Alto Calif. Pp. vii, 451. Cloth. Price in Great Britain £3 3s.

Annual Reviews, Inc., is a non-profit-making corporation, founded in 1931, which publishes each year a number of critical reviews of the current literature in certain fields of science. The *Annual Review of Entomology* was introduced in 1956, and is published in co-operation with the Entomological Society of America. These reviews are of the utmost value to the research worker and teacher, whose time is limited, and who wishes to acquaint himself with the more important recent advances in any given branch of his subject.

It is probably of more use to the reader to list the contents of this excellent publication, rather than criticise it in whole or in part. The contents of Vol. V are as follows:

R. Craig, *The Physiology of Excretion in the Insect*; E. G. Boettiger, *Insect Flight Muscles and Their Basic Physiology*; G. A. Edwards, *Insect Micromorphology*; R. A. Crowson, *Phylogeny of Coleoptera*; S. G. Smith, *Cytogenetics of Insects*; H. G. Andrewartha and L. C. Birch, *Some Recent Contributions to the Study of the Distribution and Abundance of Insects*; A. J. Thorsteinson, *Host Selection of Phytophagous Insects*; F. M. Weesner, *Evolution and Biology of the Termites*; A. W. A. Brown, *Mechanisms of Resistance Against Insecticides*; W. J. Haynes, Junr., *Pesticides in Relation to Public Health*; D. L. Gunn, *The Biological Background of Locust Control*; R. J. Courshee, *Some Aspects of the Application of Insecticides*; F. E. Todd and S. E. McGregor, *The Use of Honey Bees in the Production of Crops*; F. Weyer, *Biological Relationships Between Lice (Anoplura) and Microbial Agents*; B. Hocking, *Northern Biting Flies*; W. G. Van der Kloot, *Neurosecretion in Insects*; A. Brito da Cunha, *Chromosomal Variation and Adaptation in Insects*; R. F. Morris, *Sampling Insect Populations*; L. R. Jeppson and G. E. Carman, *Citrus Insects and Mites*: L. D. Christenson and R. Foote, *Biology of Fruit Flies*.

A.E.

Published 24th February, 1961.